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SUMMARY REPORT
OF
HYDROGEOLOGIC AND CONTAMINANT INVESTIGATIONS
RELATIVE TO
W. H. MORSE CONSTRUCTION CO., INC. PROPERTY
BENNINGTON, VERMONT

Prepared by:

William D. Norland
Hydrogeologist, LAG

Reviewed and Approved by:

Stephen Revell, C.P.G.
Sr. Hydrogeologist, LAG



Lincoln Applied Geology, Inc.
Environmental Consultants
RD # 1 Box 710 • Bristol, Vermont 05443 • (802) 453-4384 • FAX (802) 453-5399

Executive Summary

An extended hydrogeologic and contaminant investigation was performed by Lincoln Applied Geology Inc. (LAG) at the W.H. Morse Construction Co. property located in Bennington, Vt. This work was done to further evaluate subsurface contaminant related issues raised by a 1993 Phase II Environmental Site Assessment and the previous listing of the property as a Vermont Hazardous Waste Site (Site #89-0290).

The work plan for the extended investigation was approved by the Vermont Department of Environmental Conservation (VDEC) on December 20, 1993. The following comprehensive report describes the findings of the investigation and summarizes the cumulative results and conclusions.

LAG has confirmed that petroleum product soil contamination does exist on-site with a small localized zone of free phase floating oil. That oil in MW-7 has been confirmed to contain low levels of PCB's. There has, however, been no significant impact to the underlying ground waters by either PCB's or regulated petroleum product constituents. Vermont's Ground Water Enforcement Standards (GWES) have not been exceeded at the hydraulically downgradient property line. With the UST sources removed and no current activity within the dirt floored building, future exceedences of GWES are extremely unlikely.

Active ground water treatment is not warranted at this site from the regulatory perspective. Passive recovery of the limited thickness of free floating oil should be continued so that closure status can be obtained on the Hazardous Waste Site Listing by VDEC. Limited soils excavation and on-site treatment may be desirable for aesthetic reasons and disposition of the stockpiled soils remaining from the UST removal activities.



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Introduction

Lincoln Applied Geology, Inc. (LAG) has recently completed an extended hydrogeologic and contaminant investigation at the W. H. Morse Construction property located at 327 Northside Ave. in Bennington, Vermont. The site is shown on the General Location Map presented as **Figure 1**. LAG performed this extended investigation in order to develop an effective remedial action plan in response to soil and ground water contamination reported during a Phase II Environmental Site Assessment conducted by Environmental Access Group (EAG) in October 1993. The recent work performed is described in our November 29, 1993 preliminary work plan letter included as **Appendix A**. The results of these investigations are also being utilized to address the State of Vermont's regulatory concerns of the property as a listed Hazardous Waste Site (VDEC Site #89-0290)

The W. H. Morse Construction Co. property was purchased as a developed commercial facility in 1957, and the existing repair garage and offices were constructed in 1958. The building and property was used for the storage and repair of heavy construction vehicles and other equipment involved in the construction of roads and bridges. General repair and maintenance of the equipment was performed on-site.

The EAG Phase II investigation included test pits, ground water monitor well installations, soil borings, and laboratory analysis of soils and ground water that documented the following: soils contamination by waste oil in the vicinity of the former waste oil UST; free phase product atop the ground water surface in monitor well MW-7 near the former waste oil UST; petroleum contaminated soils from the floor within the building; petroleum contamination of soils at the former location of a fuel oil UST north of the building; and minor ground water contamination by BTEX components in MW-1 and MW-6 downgradient of the former fuel oil UST.

Presently the building and site property are vacant and up for sale by the owner, W. H. Morse. Based on the results of the Phase II site investigation and coordination with the Vermont Department of Environmental Conservation (VDEC), LAG performed the extended hydrogeologic and contaminant investigation by excavating four test pits, installing two additional ground water monitor wells, and collecting soil, oil, and ground water for laboratory analyses. The **Appendix A** work plan was reviewed and approved by the VDEC and a passive product recovery system was installed in MW-7.

Existing Monitoring Wells



Nine ground water monitoring wells were installed on-site by CEA Drilling Services Company (CEA) on September 1 and 2, 1993 as part of the Phase II Environmental Site Assessment Report conducted by EAG of Bennington, VT. The nine wells are labeled MW-1, 2, 3, 4, 5, 6, 7, 8, and 9 on the Detailed Site Map presented as **Figure 2**. Two sets of ground water elevation and free product thickness data collected from these wells on September 14, 1993 and January 11, 1994 are presented along with more recent ground water level data as **Table 1**. Photoionization detector (PID) data from the monitor well's headspace is included as **Table 2**.

Test Pits

On January 11, 1994 four test pits were excavated on the property for soil description purposes, PID assays, and the collection of soil samples for laboratory analyses. The test pits were excavated using a large tracked excavator operated by Burgess Brothers, Inc. of Bennington. The locations of the four test pits (TP-1, TP-2, TP-3, and TP-4) are shown on the Detailed Site Map presented as **Figure 2**. The test pit logs including soils descriptions and PID assays are included as **Appendix B**.

TP-1 is located on the east side of the building between monitor wells MW-7 and MW-8, at the former location of the waste oil UST. Soils encountered in TP-1 included coarse to medium rounded to surrounded gravel with lesser quantities of cobbles and fine to medium sand. A layer of clean sand and gravel fill is present from the surface to a depth of 2.33 feet. From 2.33 to 3.25 feet an oil odor, oily coating, and PID levels of 1.2 ppm to 7.4 ppm were detected. From 3.25 feet to the ground water surface at 4.8 feet the oil odor was stronger, PID levels increased to 12.6 ppm, and an oily sheen was observed on the ground water surface. Black, oil-covered gravel and cobbles were present to the bottom of the excavation at 5.6 feet, where PID levels attained a maximum of 32 ppm.

TP-2 is located north of the northwest corner of the building area downgradient of the former locations of a 1,000 or 2,000 gallon gasoline UST and a 3,000 gallon fuel oil UST. These tanks were taken out of service, excavated, and removed from this area several years ago. Soils encountered in TP-2 include medium to coarse gravel with lesser quantities of cobbles and fine to medium sand. A fuel oil odor and PID of 9.2 ppm was detected from soils to a depth of 3.0 feet. At a depth of 6.0 feet, PID levels increased to 82 ppm and the fuel oil odor was very strong. Ground water was present at 5.5 feet, free product droplets, and a heavy oil sheen were present on the ground water surface, and gravels and cobbles below the water surface were coated black.

TP-3 is located about 20 feet east of TP-2 upgradient of the former gasoline and fuel oil USTs. Soils encountered include fill of medium to coarse



gravel with lesser quantities of cobbles and fine to coarse sand to a depth of 3.17 feet. A native silty fine to medium sand deposit present from 3.17 to 4.83 feet had a PID level of 0.6 ppm to 1.0 ppm. A PID level of 0.6 ppm and only a very faint odor of fuel oil was detected in fine to coarse gravel with fine to medium sand and cobbles from 4.83 to 6.0 feet. The ground water surface at 5.5 feet had a slight oily sheen.

TP-4 is located immediately north of MW-7 on the east side of the building. Soils encountered during excavation included coarse to medium gravels with lesser quantities of cobbles and fine to coarse sand to a depth of 3.33 feet that exhibited a PID level of 0.6 ppm. From 3.33 to 4.33 feet is a native fine sand and silt deposit with a PID of 3.5 ppm. PID levels increased to 54 ppm from 4.33 to 5.0 feet within medium to coarse sand and gravels. The ground water surface at 5.0 feet contained a heavy oil sheen and free product droplets. Below the ground water surface to a depth of 6.0 feet the gravels and cobbles were coated black and had a PID level of 52 ppm.

Soil and Oil Analytical Results

Soil borings drilled on September 1 and 2, 1993 as part of the EAG Phase II site assessment allowed the evaluation of soil contamination by PID and laboratory analytical techniques. Soil samples from SB-3 to SB-7 in the vicinity of the former waste oil UST on the east side of the building contained slight to strong petroleum odors, slight to heavily oil stained soils, and PID levels up to 27 ppm at a depth of 5 to 7 feet (SB-4). Soil boring SB-3 contained 2,170 ppb total BTEX, and SB-4 contained 2,400 ppb PCB Arochlor - 1254. PID levels from TP-1 and TP-4 excavated by LAG in the same area during January 1994 indicate PID levels up to 32 ppm at a depth of 5.6 feet in TP-1, and PID levels up to 52 ppm at a depth of 6.0 feet in TP-4.

A soil sample collected by EAG from SB-1 in the vicinity of the two former USTs north of the building contained 78,590 ppb total BTEX. Ground water samples collected by EAG on September 14, 1993 and summarized in Table 3 indicate 12 ppb total BTEX in MW-1, 247 ppb total BTEX in MW-6, and waste oil free product in MW-7. Test Pit TP-2 excavated by LAG in January 1994 in the area of the two former USTs indicated PID levels of up to 82 ppm at a depth of 6.0 feet.

Soil samples BS-1 to BS-7 and BS-11 were collected on September 14, 1993 from a depth of 6 to 8 inches below the unpaved sand and gravel floor inside the building. The samples were analyzed for total petroleum hydrocarbons (TPH) and found to contain from a low of 530 ppm TPH (BS-5) near the northeast corner to 4,600 ppm TPH (BS-2) near the west wall to a high of 7,400 ppm TPH



(BS-11) near the former waste oil UST that was located outside the east wall of the building.

Soil samples collected on January 11, 1994 from TP-1, TP-2, and TP-4 were analyzed at the MicroAssays of Vermont (MAV) laboratory in Middlesex, VT for the petroleum constituents BTEX and MTBE. The laboratory reports are included as **Appendix C** and the results in $\mu\text{g/kg}$ (ppb) are summarized and presented below. TP-1 and TP-4 are from the area of the waste oil UST, and TP-2 is from the area of the 3,000 gallon fuel oil and 1,000 or 2,000 gallon gasoline UST.

Location	Sample Interval	Benzene	Ethyl- Toluene	benzene	Xylenes	MTBE
TP-1	2.4-3.0'	<122	<122	<122	<366	<122
TP-1	4.2-4.8'	<108	<108	<108	968	<108
TP-2	5.0-6.0'	<247	<247	921	6,040	<247
TP-4	4.3-5.0'	178	288	2,000	21,900	<105

The results of soil samples collected by EAG on September 2, 1993 and analyzed for BTEX and MTBE are presented in $\mu\text{g/kg}$ (ppb) below. Sample SB-1 is from the area of the 3,000 gallon fuel oil UST, and SB-3 is from the area of the waste oil UST.

Location	Sample Interval	Benzene	Ethyl- Toluene	Benzene	Xylenes	MTBE
SB-1	5.0'	390	1,600	8,600	68,000	<100
SB-3	5.0'	<20	<100	170	2,000	<100

Comparison of the EAG and LAG soil sample analytical results from the vicinity of the waste oil UST indicate levels of BTEX in the vicinity of the 3,000 gallon fuel oil UST detected by EAG (78,690 ppb) in SB-1 are an order of magnitude greater than those detected by LAG (7,449 ppb) in TP-2. This difference is likely the result of sampling from two different subsurface locations within the same general area. In the area of the former waste oil UST, BTEX levels detected by LAG (1,292 ppb) in TP-1 are comparable to the levels detected by EAG (2,290 ppb) in SB-3. BTEX levels in TP-4 located north of TP-1, SB-3, and the former waste oil UST are considerably greater at 24,366 ppb.

Contamination of soils in the vicinity of the fuel oil and gasoline USTs may have occurred from: overfills of the USTs, vehicles, or other equipment; leaks in the underground delivery piping; and/or leaking USTs. Since the petroleum sources have been removed, it is likely that the soil contamination levels will continually decline due to microbial activity and other natural degradation



processes. Soils contamination in the area of the former waste oil UST was also probably caused by the same processes, and contamination levels are likely to decrease over time.

Below are the summarized analytical results of soil samples collected in the area of the former waste oil UST by EAG on September 2, 1993 and by LAG on January 11, 1994. The EAG analytical results are included in the Phase II report, and the LAG analytical results are included as **Appendix C**.

Sample Location Interval		September 2, 1993 PCB Arochlor - 1254	January 11, 1994 PCB - Arochlor 1254
SB-4	5.0'	2,400	-----
SB-6	5.0'	<250	-----
TP-1	2.4'-3.0'	-----	384
TP-1	4.2'-4.8'	-----	1,450

Both sets of analytical results confirm the presence of minor levels of PCBs in the soils, however levels are well below the PCB hazardous waste threshold level for soils of 50,000 ppb (50 ppm) or greater.

Samples of free product waste oil were collected by EAG on September 14, 1993 and LAG on January 11, 1994 from above the ground water surface in MW-7 and analyzed for PCBs. The EAG laboratory report is included in the Phase II Report, and the LAG laboratory report is included as **Appendix C**. Both analytical results are presented in ug/l (ppb) below:

Location	September 14, 1993 PCB Arochlor - 1254	January 11, 1994 PCB Arochlor - 1254
MW-7 (oil)	71,000	64,200

Although the level of PCBs detected by analytical methods in oil from MW-7 has declined slightly, it remains at the same relative low level. The oil is considered hazardous since it contains greater than 50,000 ppb (50 ppm) PCBs. All oil and oil-contaminated materials associated with passive oil recovery from MW-7 are drummed on-site and will be disposed as a hazardous waste in the future.

Waste oil stored in the former waste oil UST located on the east side of the building was a mixture of mostly used crankcase oil with some hydraulic oils from servicing the construction vehicles and equipment. The source of PCBs in the waste oil is most likely from hydraulic fluids, lubricants, and cutting oils used in the construction business.



In general, soil PID data and BTEX and PCB analytical data obtained by EAG in September 1993 and LAG in January 1994 correlate well. This data identifies two distinct areas where soil contamination is elevated: the area of the former waste oil UST east of the building; and the area of the former fuel oil and gasoline USTs to the north of the building. EAG also identified elevated TPH in soils within the building.

Monitor Well MW-7

Waste oil free product has been consistently detected floating atop the ground water in MW-7. A Soak Ease adsorbent bailer was installed on January 11, 1994 for the passive recovery of free phase product. At that time a trace (0.01') of free product was measured in the well. On January 19th the Soak Ease bailer was replaced, and a trace of free product was again detected in the well. The Soak Ease bailer was replaced and 0.04' of free product was detected in the well on January 25th. Since then no free product has been detected in the well, although the Soak Ease bailer was again replaced on March 3, 1994.

The total estimated quantity of waste oil free product recovered from MW-7 by using Soak Ease adsorbent bailers during the period January 11th to March 7th is 2.5 quarts or 0.63 gallons. Free product recovery using the passive adsorbent bailer methods has been quite successful and will be continued. All used bailers, disposable gloves, and other waste oil contaminated materials are disposed in a closed 55-gallon drum located on-site. Due to the presence of greater than 50,000 ppb (50 ppm) PCBs in the oil from MW-7, the drummed materials will be transported and disposed of as a hazardous waste oil/PCB waste. Thicknesses of free product in MW-7 are shown in **Table 1.**

New Monitor Wells

Ground water monitor wells MW-10 and MW-11 were installed by Tri State Drilling and Boring, Inc. (TSDB) under LAG supervision on January 19, 1994. The locations of MW-10 and MW-11 are shown on **Figure 2**. These locations were chosen so that representative ground water samples could be obtained downgradient of the two areas of identified soil contamination. The TSDB well logs and LAG detailed well logs are both presented as **Appendix D**.

Continuous soil samples were collected during drilling using a two foot split barrel sampler. Soils were screened for the presence of volatile organic compounds (VOCs) using a PID, and then logged descriptively. MW-10 is located in the northwest corner of the property near MW-1. Soils encountered during drilling MW-10 include silt and very fine sand with marsh organic material to a depth of about 7 feet, beneath which are medium to coarse gravel and medium to



coarse sand. Below a depth of 10 feet heaving sand entering the auger prevented sample collection. PID values of split spoon soil samples were low, ranging from 2.9 ppm from a depth of 6 to 8 feet to 4.1 ppm at 4 to 6 feet, and petroleum odors were absent. A 2-inch PVC monitoring well was then installed to a depth of 13 feet. Ground water was present at about 5 feet.

While drilling MW-11 on the north side of the building, fill materials consisting largely of boulders and cobbles prevented the augers from penetrating below a depth of 4 feet. The third boring attempt was successful, and soil samples retrieved by the split spoon consisted mostly of fine to coarse sand with fine to coarse gravel to the bottom of the boring at 14 feet. The greatest PID level from MW-11 soils was 3.9 ppm from 4 to 5.25 feet, and at a depth of 10 to 11.5 feet the PID level was 0.7 ppm. No petroleum odors were present. A 2-inch PVC monitoring well was then installed to a depth of 13 feet. Ground water was present at about 4.5 feet. Following installation, each well was properly developed until clear of fines, and then a stadia survey established the location and elevation of the top of casing (TOC) of each well in relation to other wells on-site.

Ground Water Monitoring

EAG performed ground water level monitoring on the original nine wells on September 14, 1993. Full ground water elevation monitoring surveys were conducted on the nine existing wells and the two new wells on January 25th, February 22nd, March 3rd, and March 7, 1994. Full PID monitoring surveys were conducted on January 25th, March 3rd, and March 7, 1994. The ground water elevation and PID data has been summarized and is presented as **Tables 1** and **2**, respectively.

Data from **Table 1** shows a monitor well ground water level fluctuation ranging from 0.46 feet in MW-6 to 2.98 feet in MW-5 during the period of record. Review of **Table 2** indicates that elevated but fluctuating soil vapor levels are associated with MW-6 in the vicinity of the former fuel oil and gasoline UST, as well as MW-7 and MW-8 in the vicinity of the former waste oil UST.

Site Hydrogeology

Ground water elevation data from **Table 1** has been used to develop three ground water contour maps showing ground water gradients and the direction of ground water flow on-site. The ground water contour map for January 25, 1994 presented as **Figure 3** shows a dominant east to west ground water flow direction. The ground water gradient between MW-5 and MW-8 is steeper at 0.104 feet per foot (ft/ft) than the shallower gradient at 0.005 ft/ft between MW-11 and MW-9.



Ground water contour maps from February 22, 1994 and March 3, 1994 presented as **Figures 4 and 5**, respectively are nearly identical, showing the dominant east to west ground water flow pattern but with a northwest flow component in the vicinity of the building. The ground water gradient closely mimics the surface topography of the site, being greatest on the westward sloping hill in the eastern part of the site and shallowest in the flatter, more level western part of the site.

Both the borings drilled for monitor wells and test pits excavated on-site penetrated the upper unconsolidated surficial aquifer. Descriptive soil logs reveal that although the aquifer is dominated by thicker units of highly permeable medium to coarse gravels with sand, there exist thinner interbeds of less permeable fine to coarse sand with gravel or thin silt and fine sand interbeds within the fluvial-dominated valley bottom site. The shallow well logs do not indicate the presence of a widespread lower confining unit beneath the fluvial gravels and sand, however one may exist at greater depths.

In test pits TP-1, TP-2, and TP-4, the greatest soil PID levels were encountered at and slightly below the current ground water table. In this zone the petroleum contaminants are adsorbed onto the fine to coarse sands occupying the space between the clast-supported gravel and cobbles, and also coat the gravel surfaces. Ground water level fluctuations appear to have smeared the adsorbed contaminants vertically within the soils, creating a narrow 'zone of accumulation'. The ground water quality data discussed below does indicate that the petroleum contaminants are relatively immobile and adsorbed to the soil matrix.

Ground Water Quality

On January 25, 1994 ground water samples were collected from all on-site monitor wells and the Bennington Acres (B.A.) Motel and Apartments drilled bedrock drinking water well located downgradient to the northwest of the site. All ground water samples were analyzed by purge and trap gas chromatographic techniques for the petroleum constituents BTEX and MTBE. The MAV laboratory reports are presented as **Appendix E**. The water quality results have been summarized along with the previous water quality data collected to date and is included as **Table 3**. **Figure 6** is a water quality summary map of the January 25, 1994 ground water quality data to depict the areal distribution of the low level ground water contaminants.

Review of the actual data in **Appendix E** indicate the following low levels of ground water contamination: MW-6 contained 17 ppb total BTEX (12 ppb benzene and 3 ppb xylenes); MW-7 contained 21 ppb total BTEX (18 ppb xylenes), and; MW-10 contained 11 ppb total BTEX (3 ppb toluene and 6 ppb xylenes). The remaining wells demonstrated non detectable levels of the BTEX



constituents with respect to Vermont's Ground Water Enforcement Standards (GWES). The only exceedance is the 12 ppb benzene in MW-6. The GWES for benzene is 5 ppb.

MTBE was not detected in any of the ground water samples. Other remaining monitor wells and the B.A. Motel and Apartments bedrock well contained no detectable levels of BTEX. When dissolved total BTEX levels from September and October 1993 are compared to the January 1994 data, levels in MW-1 have declined slightly, while MW-6 levels have declined significantly. As mentioned previously, the quantity of free product present in MW-7 has also declined.

Following confirmation of the PCB contaminant in the floating oil from MW-7, three additional ground water samples were obtained for PCB analysis. Copies of the analytical results for the samples obtained from MW-7, 8, and 11 are included in **Appendix E**. No PCB arochlors were detected in any of the samples although an estimated 40 ppb of an unspecified PCB was detected in the MW-7 sample. It must be noted at this point that the MW-7 sample was obtained by bailer techniques beneath the thin layer of oil that has been confirmed to contain the PCB Arochlor-1254. Minute cross contamination of the underlying ground waters by the oil cannot be ruled out. The adjacent well, MW-8, and the downgradient well, MW-11, demonstrated no detectable evidence of PCB's. This cumulative water quality data indicates that no significant PCB or petroleum product impact has occurred to the ground water underlying the Morse site.

Conclusions

The interior of the building was used for the repair and storage of trucks and other heavy construction equipment and vehicles, and for the storage of oils and other petroleum-related substances used for construction equipment and vehicles. Spillage, leakage, and/or poor housekeeping practices have likely all contributed to the observed petroleum contamination of soils within the building. The greatest levels of contamination are along the walls of the building where former barrels of oils, etc. were stored (north wall), a former 275-gallon waste oil tank (northwest corner) and a former 500 gallon fuel oil tank (southwest corner) were situated, and closest to the former waste oil UST outside the building (east wall) as described in the October 1993 EAG Phase II Site Assessment Report. The levels of contamination found in the soils do not represent a risk to public health or the environment.

Elevated levels of BTEX contamination were detected in soil from TP-2 at a depth of 4 to 6 feet, both by PID (> 10 ppm) and laboratory analysis. Total BTEX contamination of ground water in MW-6 has declined from September 1993, but at 12 ppb benzene remains above the GWES. The presence of the



former 3,000 gallon fuel oil UST and 1,000 or 2,000 gallon gasoline UST to the north of the building has apparently caused the soil and ground water contamination observed in TP-2 and MW-6. No off-site ground water contamination related impacts have been observed or are expected, and there is no threat to public health and the environment.

Soils contaminated with waste oil that were excavated from an earlier test pit at the former waste oil UST location remain stockpiled on open land to the southeast of the building. The soils presently remain frozen and will be evaluated during the Spring.

Limited non-hazardous levels of PCB soil contamination by 1,450 ppb PCB Arochlor - 1254 is present in TP-1 at the former location of the waste oil UST. The source of the PCBs is most probably from an additive associated with the hydraulic and lubricating oils used routinely in construction vehicles and equipment. Routine vehicle/equipment servicing generated waste oils that were stored in the waste oil UST on the east side of the building. A sample of waste oil from atop the ground water surface in MW- 7 contained 64,200 ppb PCB Arochlor - 1254, making the waste oil a hazardous material since it exceeds the threshold of 50,000 ppb (50 ppm). Free waste oil product in MW-7 has decreased considerably since successful passive recovery using Soak Ease bailers was initiated in January 1994. Contamination of soils by 24,366 ppb total BTEX is present in TP-4 along the exterior east wall of the building. Soils in TP-1 from a depth of 4 to 5.6 feet contained elevated PID levels > 10 ppm, and soils from a depth of 4 to 6 feet in TP-4 had PID levels > 10 ppm.

The surficial unconsolidated fluvial gravel and sand aquifer underlying the site is highly permeable and thus should readily demonstrate the effect of contaminants entering the ground surface, if significant. Ground water elevation data indicates that the dominant ground water flow direction on-site is toward the west. Petroleum contamination of soils is greatest in an 'accumulation zone' near the ground water surface where 'smearing' of the contaminants has been caused by ground water level fluctuations. The combined soils and ground water quality data indicate that the contaminant source areas are very limited and that natural soil and ground water attenuation processes have effectively immobilized the contaminants and prevented their migration. Analytical results from the B.A. Motel and Apartments drilled bedrock well ground water indicate no BTEX or MTBE contaminant impacts.

Petroleum product contaminants within the soil are strongly bound and immobilized precluding extensive impact to ground water and off-site migration. Active remediation is not warranted other than removal of the limited free floating oil in MW-7. Soils removal is not warranted from the perspective of protecting public health and the environment although limited excavation and on-



site treatment may be appropriate from the perspective of a successful real estate transfer.

Recommendations

The waste oil free product in MW-7 should continue to be recovered using the current level of passive recovery with Soak Ease adsorbent bailers. The degree of waste oil saturation of the bailer can be evaluated on a weekly basis by LAG and replaced if necessary during regularly scheduled visits to other PCF sites in the Bennington area. All waste oil contaminated materials will continue to be drummed on-site and then disposed as a hazardous waste oil/PCB waste.

The level of petroleum contamination in the ground water is minimal, no off-site environmental receptors are known or expected to be impacted, and there appears to be no threat to human health or the environment. The petroleum contaminants in the vicinity of the former waste oil UST and the former fuel oil and gasoline USTs appear to be adsorbed to the soil matrix within an 'accumulation zone' within the seasonal fluctuation range of the ground water surface. The contaminants are relatively immobile. We believe that no active ground water remediation is warranted, however monitoring of ground water levels and collection of water quality samples from all monitor wells should be performed on a semi-annual basis in order to confirm that petroleum contaminant levels are not increasing and naturally occurring bioremediation is occurring.

Petroleum contaminated soils from the area of the former waste oil UST that are currently stockpiled on-site will be evaluated by PID when thawed in the spring. If PID contaminant levels are low, as expected, then with VDEC approval, the soils will be mixed with manure and landfarmed on-site according to VDEC protocols for landfarming petroleum contaminated soils. Any additional soils excavated in or around the existing building as a condition of pending real estate transactions should be handled according to the VDEC protocols for contaminated soils, and where appropriate, be landfarmed with the existing stockpiled soils.



Project: Morse Property
 Location: Bennington, Vermont

Table 1
 VDEC Site # 89-0290
 Sheet 1 of 2

Ground Water Elevation/Product Level (feet)

Data Point	TOC	9-14-93	1-11-94	1-19-94	1-25-94	2-2-94	2-16-94	2-22-94
MW-1	98.57	93.66	93.52	93.53	93.50			93.99
MW-2	98.57	94.57	94.33		93.72			94.94
MW-3	97.94	94.56	94.52		93.78			95.69
MW-4	126.16	118.64	118.40		118.36			118.61
MW-5	126.14	120.36	121.03		121.09			123.34
MW-6	98.70	93.64	93.63	93.66	93.63			
MW-7	99.48					95.15	94.92	96.06
MW-8	99.44	95.07	95.03		94.83			96.97
MW-9	98.98	94.08	93.96	93.99	93.88			94.38
MW-10	97.95			93.19	93.10			93.63
MW-11	98.80			94.12	94.11			94.70

Notes:

1 - Elevation datum assumed

2 - Reference elevation is elevation of top of PVC well casing

Light Grey Cells = Dry

Dark Grey Cells = Inaccessible

Project: Morse Property
 Location: Bennington, Vermont

Table 1
 VDEC Site # 89-0290
 Sheet 2 of 2

Ground Water Elevation/Product Level (feet)

Data Point	TOC	3-3-94	3-7-94				
MW-1	98.57	94.01	93.69				
MW-2	98.57	94.94	94.42				
MW-3	97.94	95.71	94.54				
MW-4	126.16	118.62	118.17				
MW-5	126.14	123.34	120.65				
MW-6	98.70	94.09					
MW-7	99.48	96.07	95.46				
MW-8	99.44	96.99	95.17				
MW-9	98.98	94.40	93.95				
MW-10	97.95	93.64	93.51				
MW-11	98.80	94.72	94.23				

Notes:

- 1 - Elevation datum assumed
- 2 - Reference elevation is elevation of top of PVC well casing
- Light Grey Cells = Dry
- Dark Grey Cells = Inaccessible

Project: Morse Property
 Location: Bennington, Vermont

Table 2
 VDEC Site # 89-0290
 Sheet 1 of 1

Photoionization Results (PID - ppm)

Data Point	1-19-94	1-25-94	2-2-94	2-16-94	3-3-94	3/7/94
MW-1	0.2	1.6			3.2	BG
MW-2		BG			BG	0.4
MW-3		BG			BG	0.4
MW-4		BG			BG	BG
MW-5		BG			BG	BG
MW-6	9.9	11.2			2.6	
MW-7	35	SL	150	26	22	2.0
MW-8		12.6			8.2	0.6
MW-9	BG	BG			0.2	1.2
MW-10	1.9	1.2			BG	BG
MW-11	0.2	0.2			1.2	1.0

Notes:

BG - Background

SL - Saturated Lamp

Dark Grey Cells = Inaccessible

Ground Water Quality Results (ppb)

Data Point	9/14/93	10/8/93	1/25/94			
MW-1	12	<5	<6	<1		
MW-2	<16	<5	<6	<1		
MW-3	<16	<5	<6	<1		
MW-4	<16	<5	<6	<1		
MW-5	<16	<5	<6	<1		
MW-6	247	8 46	<5 17	<1		
MW-7			21	<1		
MW-8	<16	<5	<6	<1		
MW-9	<16	<5	<6	<1		
MW-10			11	<1		
MW-11			<6	<1		
B.A Motel/ Apartment			<6	<1		

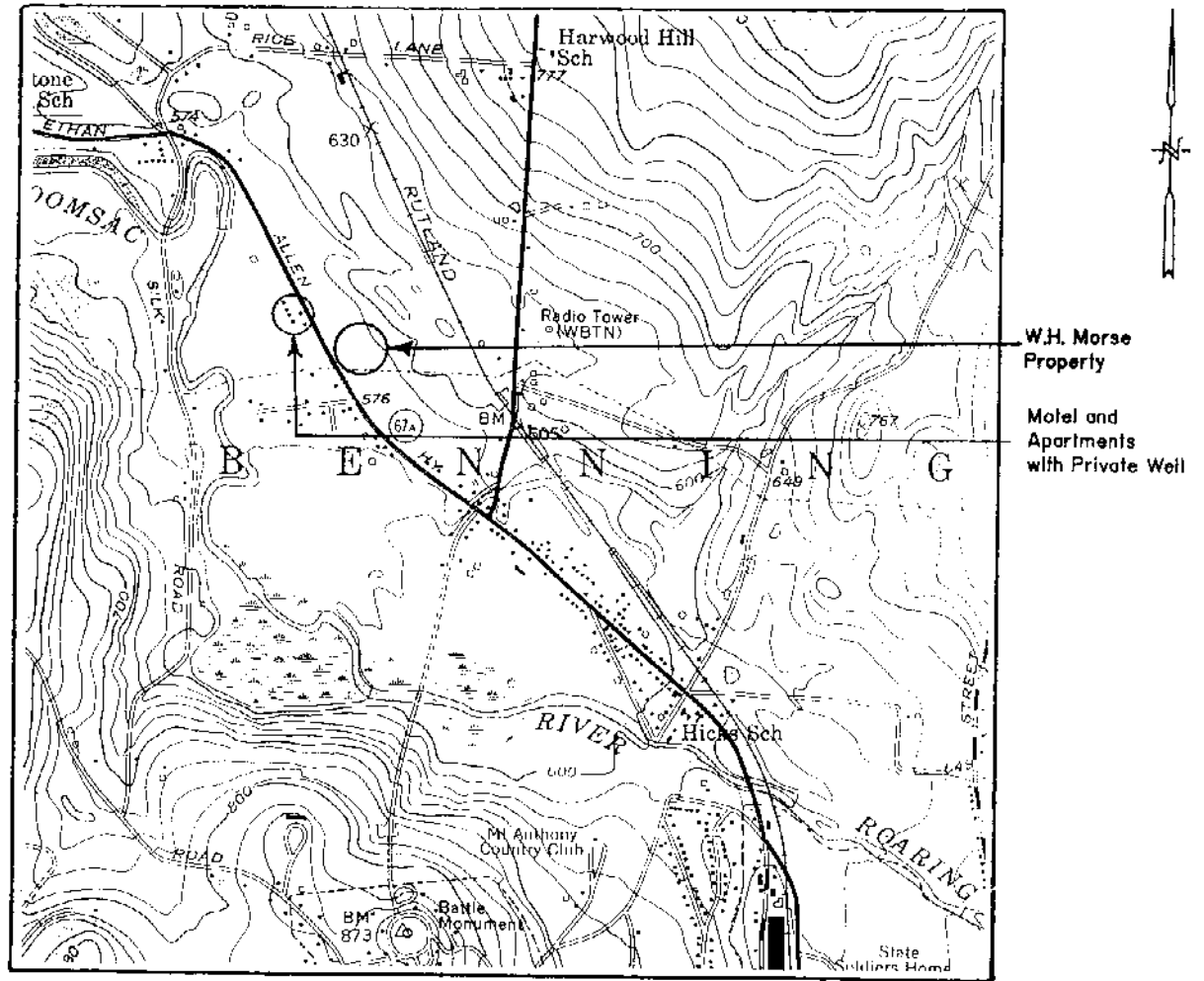
NOTES:

MTBE in upper right corner of cell

BTEX in lower left corner of cell

< - Contaminant not detected at specified detection limit

W.H. Morse Property GENERAL LOCATION MAP



Source: U.S.G.S. 7.5 min.
Topo Series 1954
Bennington, VT Quad.

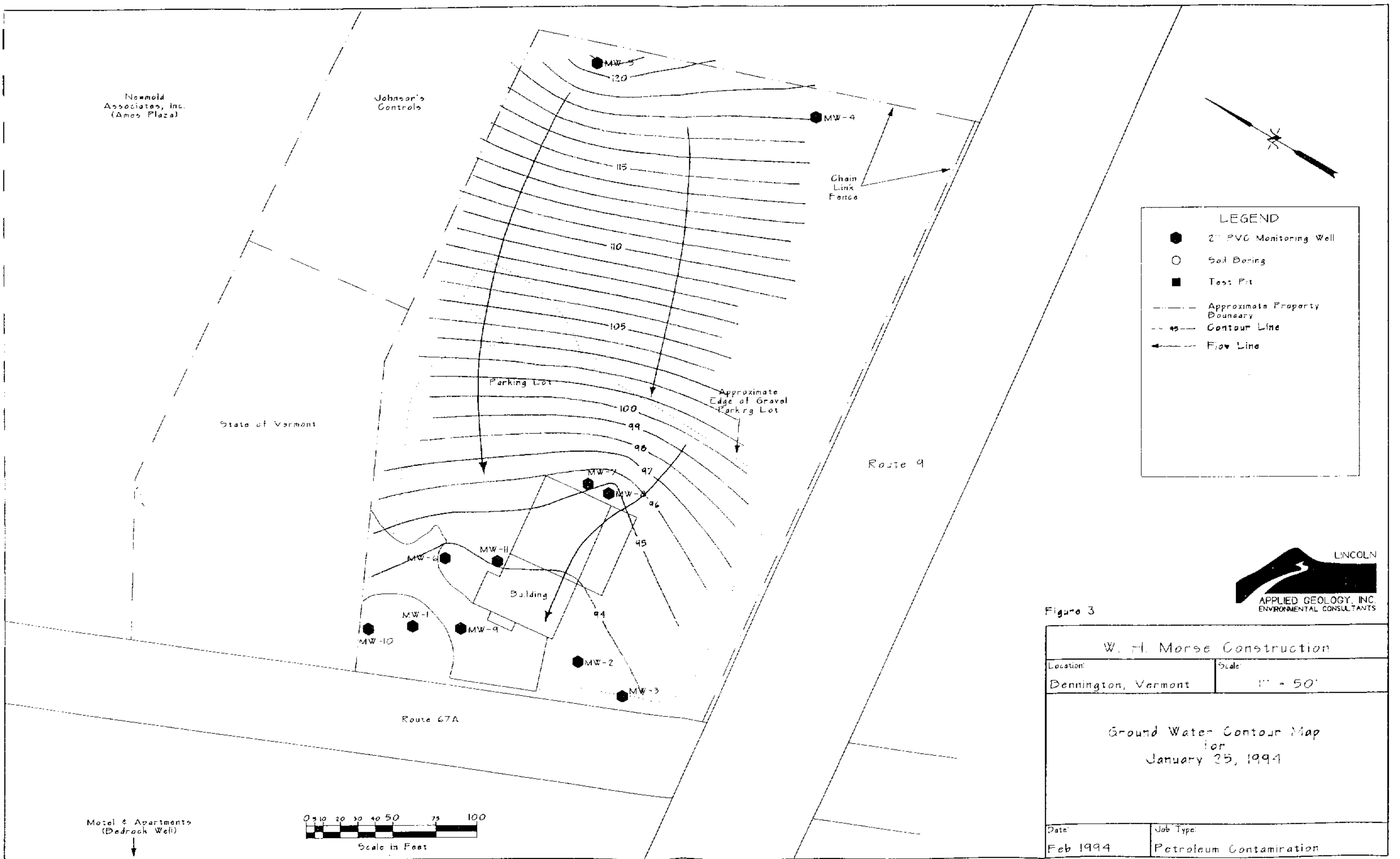
Scale: 1" = 2000'



Figure 2



W. H. Morse Construction	
Location:	Scale:
Bennington, Vermont	1" = 50'
Detailed Site Map	
Date:	Job Type:
Feb 1994	Petroleum Contamination



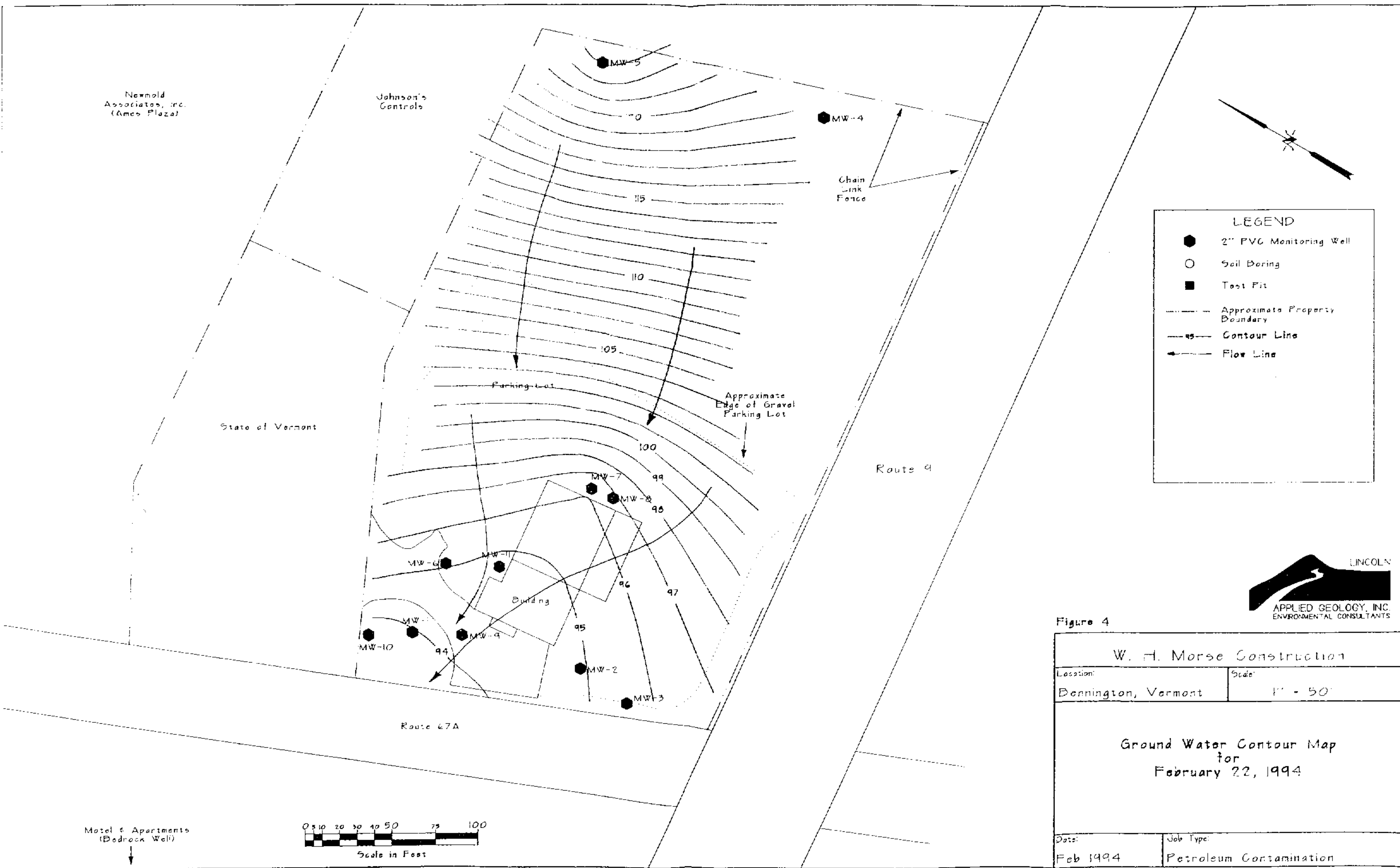


Figure 4

W. H. Morse Construction	
Location:	Scale:
Bennington, Vermont	1" = 50'
Ground Water Contour Map for February 22, 1994	
Date:	Job Type:
Feb 1994	Petroleum Contamination

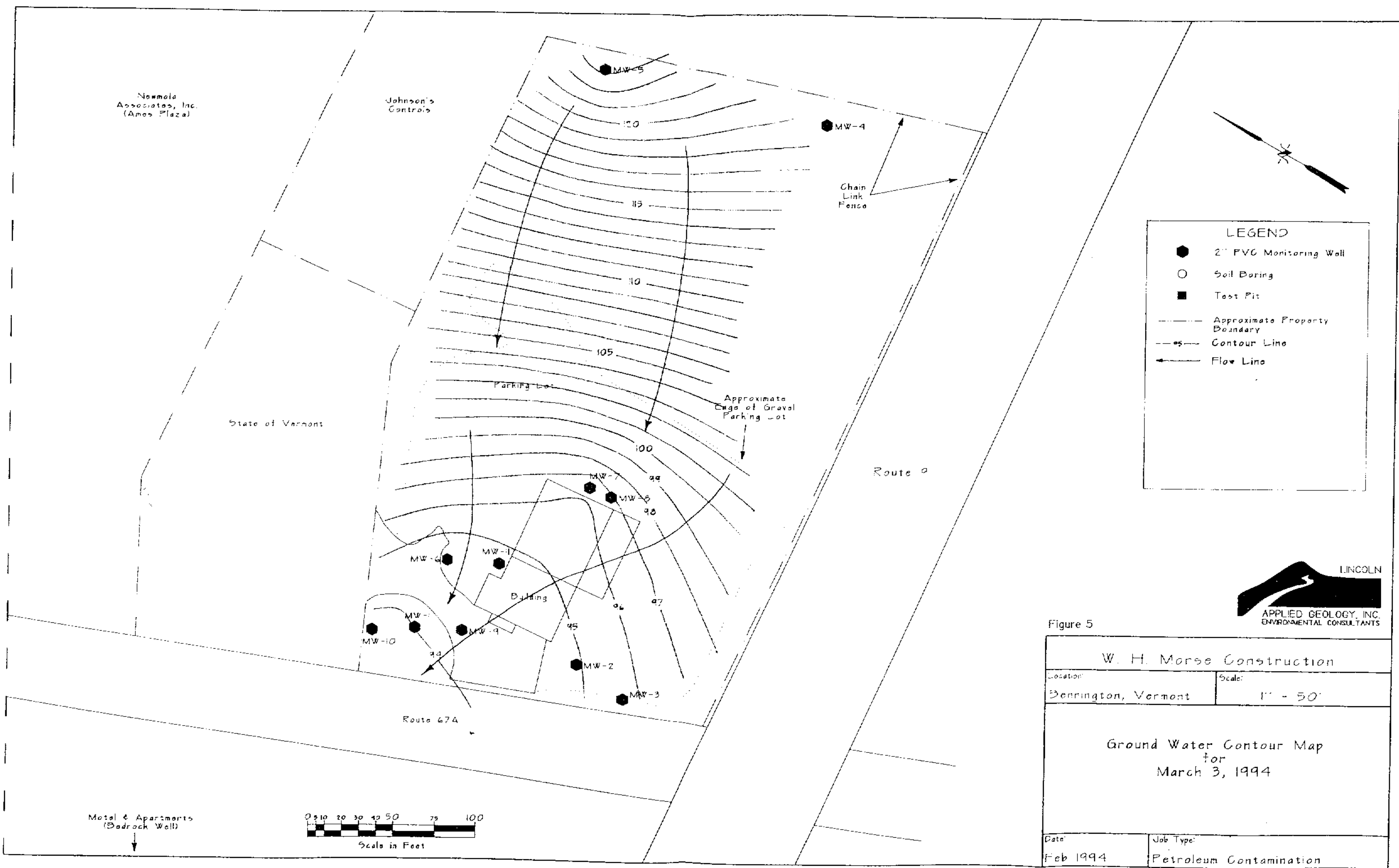


Figure 5

W. H. Morse Construction	
Location:	Scale:
Dennington, Vermont	1" = 50'
Ground Water Contour Map for March 3, 1994	
Date:	Job Type:
Feb 1994	Petroleum Contamination



APPENDIX A

LAG November 29, 1993 Preliminary Work Plan Letter



November 29, 1993

Mr. Charles B. Schwer
Petroleum Sites Coordinator
Vermont Department of
Environmental Conservation
103 South Main Street
Waterbury, Vermont 05676

RE: Petroleum Contamination at the Morse Construction Property in
Bennington - Submittal of Preliminary Work Plan & Cost Estimate
(Site #89-0290)

Dear Mr. Schwer

At the request of Mr. William H. Morse, Lincoln Applied Geology, Inc. (LAG) reviewed the site assessment report prepared by the Environmental Access Group (EAG). I also recently visited the property with Mr. Morse, his attorney, Mr. John Williams, and Mary Eddington of EAG to get a better feel for site conditions and the potential significance of the contamination problem. On the basis of my review and site visit, I preliminarily view the contamination problem as anything but an impending threat to either the environment or human health. Although two areas of soil contamination have been identified, their ultimate impact on the underlying ground water system appears to be negligible. Based upon the presence of reasonably high permeability soils in both the unsaturated and saturated zone of the two contaminated soil areas, I preliminarily believe that if the soil contamination is anything but an immobile residual type problem, the underlying ground water system would show significant evidence of being impacted. Based on the existing water quality database, this does not appear to be the case. At this point, I have questions regarding the nature of the free product identified in MW-7. It may be that the free product in MW-7 originated in response to the disruption of the soils in the former waste oil UST area, caused by monitoring well and test pit installation. At this point, my biggest concern is worker related exposure if the soils in the two areas are disturbed in response to a change in property use, resulting in some type of subsurface excavation.

With regard to my preliminary conclusions, as well as, the Sites Management Section's (SMS) November 10, 1993 conclusions and requests, I have compiled a preliminary scope of work (SOW) to address our joint concerns. The proposed SOW includes:

1. preparation of a health and safety plan,
2. the manual recovery of free phase product from MW-7 and conduction of PID, water, and product level surveys,
3. a complete evaluation of the information and data presented in the EAG assessment report,
4. the completion of a contaminant receptor evaluation,
5. the conduction of a soil related contaminant evaluation using test pit methods,
6. the conduction of a soil gas survey, if determined warranted by the test pit evaluation,
7. the placement of additional soil borings and the construction of additional monitoring wells,
8. the conduction of a water quality sampling survey, and
9. the preparation of a summary report which defines: the hydrogeology of the site, the status of contaminants at the site, the need of removing and disposing of contaminated soils, and the need for a long term treatment and/or monitoring plan which addresses the contamination at the site.

LAG plans to proceed with this proposed SOW in a multi-phase approach to quickly and effectively assess and remediate contamination (if warranted) at the site. The proposed work will be completed in a timely manner akin to other comparable projects that we have recently worked on with the SMS.

Phase I - Health and Safety Plan Preparation, Existing Data and Receptor Evaluation, and Product Recovery

An appropriate health and safety plan (HASP) will be prepared before the conduction of any further on-site investigations or remedial activities at the site. The HASP will be written to address all activities proposed in this preliminary



work plan. The existing hydrogeologic and contaminant related information will be reviewed and reevaluated for confirmation purposes and to better determine the distribution of geologic materials and contaminants beneath the site, and to further evaluate and/or estimate hydrogeologic characteristics which control both contaminant migration and attenuation processes. Since there is still a question of private well usage downgradient of the site, the contaminant receptor evaluation initiated by EAG will be completed. Free product recovery from MW-7 will be initiated utilizing Soak-Ease bailers. A bailer will be established in MW-7 and monitored on a weekly basis along with PID, water, and product level surveys during the first month of site related activity. The weekly monitoring will be conducted and coordinated with our site visits to other Bennington area sites that we are working on. If we determine the need of more frequent Soak Ease exchanges, we will coordinate with EAG to carry out the replacements since they are located less than one mile from the site. A product recovery log will be maintained which records free product thickness and amounts recorded.

Phase 2 - Extended Subsurface Investigation

Additional subsurface investigations are required to confirm the presence of the soils described by EAG, and to further define the nature of the contaminants, as well as, their horizontal and vertical extent. The overall extended investigation will be initiated with the placement of three backhoe test pits at the locations shown on **Figure 1**. The soil profile will be fully evaluated and the presence of contaminants will be evaluated by PID, olfactory, and visual means. If determined appropriate, up to three soil samples per test pit will be collected and assayed for petroleum product identification and quantification for TPH, BTEX, and any indications of biological degradation. Soil samples collected in the waste oil underground storage tank (UST) area will also be evaluated for PCB's. Based on the results of the test pit evaluation, a soil gas survey is preliminarily planned for both former UST areas shown on **Figure 1** to help define the horizontal extent of the soil related contamination. We plan to evaluate several soil gas samples for indicators of naturally occurring biological activity.

At this point in time, we believe that a maximum of two additional monitoring wells are needed to properly evaluate impacts attributable to the two former UST areas. Their proposed locations are shown on **Figure 1**. They will be used to define the presence of ground water related contaminants



at the most downgradient property line and in a location directly downgradient of the former waste oil UST. The wells will be installed in accordance with normal SMS standards, and all penetrated soils will be continuously evaluated for soil characteristics and PID levels. All new wells will be properly developed using non-turbulent techniques. After a one week equilibration period, all new and existing monitoring wells will be properly purged, sampled and analyzed for the presence of volatile organics (BTEX and MTBE) by purge and trap gas chromatography/mass spectrometry with non petroleum product peak identification. This methodology is akin to EPA method 8260. In addition, MW-7 and the proposed new monitoring well directly downgradient of the waste oil UST will be sampled and analyzed for the presence of PCB's in water.

Phase 3 - Summary Report Preparation

After all aspects of Phase 1 and 2 have been completed, a formal summary report of all activities will be prepared and submitted to the SMS. The results of the activities will be directed towards defining:

1. the hydrogeology of the site,
2. the status of contaminants at the site.
3. the need of removing and disposing of contaminated soils from the two former UST areas,
4. other means of remediating the contaminated soils using in-situ or on-site methods,
5. a plan to address the stockpiled soils at the site, and
6. long term treatment methods and/or a monitoring plan (and associated costs) which addresses the contamination, if warranted.



Mr. Chuck Schwer
Page 5
November 29, 1993

We look forward to your concurrence with the presented SOW, so that it can be initiated in the very near future. Please do not hesitate to contact me if you have questions or comments regarding this work plan. A cost estimate has been prepared for the proposed activities and is included in **Appendix B**.

Very truly yours,



Steve Revell
Sr. Hydrogeologist

SR/lr
Enclosures
cc: William Morse
John Williams II
Mary Eddington



Lincoln Applied Geology, Inc.
Environmental Consultants

RD # 1 Box 710 • Bristol, Vermont 05443 • (802) 453-4384 • FAX (802) 453-5399

NEWMOLD
ASSOCIATES INC.

Johnson Controls

AREA 1 FORMER FUEL OIL UST AREA
(Proposed Soil Gas Survey Area)

AREA 2 FORMER WASTE OIL UST AREA
(Proposed Soil Gas Survey Area)

SITE
6.01 ACRES

AREA 3 FORMER INTERIOR BUILDING USE AREAS
CONTAMINATED SOIL PILE

- Building Soil
- Soil Boring
- ⊙ Groundwater Monitoring Well
- ▣ Test Pit
- Proposed Test Pit
- Proposed Monitoring Well

0 100 200 300
SCALE IN FEET

ENVIRONMENTAL ACCESS GROUP RR2, Box 3709, Harwood Hill Bennington, Vermont 05201		
SCALE	APPROVED BY	DRAWN BY SJE
DATE 9-14-93		REVISED LAG
CONTAMINATED SOIL & GROUNDWATER AREAS Preliminary Test Pit, Monitoring Well, and Soil Gas Survey Locations		
W. H. MORSE CONSTRUCTION Bennington, VT		DRAWING NUMBER FIGURE 1

APPENDIX B

Cost Estimate

**Morse Construction Property
Preliminary Work Plan
Cost Estimate
November 1993**

**Phase 1 - Health & Safety Plan Preparation, Existing Data and Receptor
Evaluation, and Product Recovery**

A. Health & Safety Plan Preparation

Hydrogeologist 1 hr @ \$45/hr	\$45.00
Secretary 1.5 hrs. @ \$30/hr	45.00
Total A	\$90.00

B. Existing Data Evaluation

Sr. Hydrogeologist 2 hrs. @ \$75/hr	\$150.00
Hydrogeologist 8 hrs. @ \$45/hr	360.00
Computer Tech 4 hrs. @ \$30/hr	120.00
Total B	\$630.00

C. Receptor Evaluation

Hydrogeologist 4 hrs. @ \$45/hr	\$180.00
Total C	\$180.00

D. Weekly Product Recovery and Monitoring

Technician 4 hrs. @ \$30/hr	\$120.00
Mileage - 100 mi. @ 0.30/mi	30.00
PID/Interface probe	75.00
Soak-Ease Kit (includes bailer & replacement socks)	168.00
Total D	\$393.00

Total Phase 1 \$1293.00



Phase 2 - Extended Subsurface Investigation

A. Test Pit Evaluation

Senior Hydrogeologist 2 hrs. @ \$75/hr	\$150.00
Hydrogeologist 8 hrs. @ \$45/hr	360.00
9 soil samples @ \$100/ea (BTEX,TPH)	900.00
3 soil samples @ \$95/ea (PCB)	285.00
Mileage - 250 miles @ 0.30/mi	75.00
Backhoe Supplied by Mr. Morse	

Total A **\$1770.00**

B. Soil Gas Survey

Hydrogeologist 10 hrs. @ \$45/hr	\$450.00
Field Technician 8 hrs. @ \$30	240.00
Tech OT 2 hrs. @ \$45/hr	90.00
Mileage 200 @ \$.30	60.00
Soil Vapor Probe 1 day @ \$125/day	125.00
PID 1 day @ \$75/day	75.00
Hammer Drill 1 day @ \$47/day	47.00
Generator 1 day @ \$35/day	35.00

Total B **\$1122.00**

C. Monitor Well Installation, Supervision & Stadia Survey

Drillers Charges	\$1467.00
Hydrogeologist 10 hrs. @ \$45/hr	450.00
PID 1 day @ \$75/day	75.00
Mileage 200 @ \$.30	60.00

Total C **\$2052.00**



Lincoln Applied Geology, Inc.
Environmental Consultants

RD # 1 Box 710 • Bristol, Vermont 05443 • (802) 453-4384 • FAX (802) 453-5399

D. Water Quality Sampling & Analysis Survey

Field Technician 10 hrs. @ \$30/hr	\$300.00
Mileage 200 @ \$.30	60.00
Pump & Generator 1 day @ \$110/day	110.00
Bailers 11 @ \$6.75/each	74.25
PID 1 day @ \$75/day	75.00
Lab Analyses for BTEX & MTBE 13 @ \$62/each	806.00
Lab Analyses for PCB's 2 @ \$80.00	160.00

Total D \$1585.25

Total Phase 2 \$6529.25

Phase 3 Summary Report Preparation & Submittal

Sr. Hydrogeologist 4 hrs. @ \$75/hr	\$300.00
Project Manager 8 hrs @ \$50/hr	400.00
Hydrogeologist 16 hrs. @ \$45/hr	720.00
Computer Technician 12 hrs. @ \$30/hr	360.00
Secretary 10 hrs. @ \$30/hr	300.00

Total Phase 3 \$2080.00

Grand Total All Phases \$9902.25



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Environmental Consultants

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APPENDIX B

Detailed Test Pit Logs

TEST PIT LOG

TEST PIT: TP-1
 LOCATION: Morse Property, Rte. 67A, Bennington, VT
 EXCAVATOR: Burgess Brothers, Bennington, VT
 HYDROGEOLOGIST: William Norland, Lincoln Applied Geology, Inc.
 DATE: 1/11/94

Soils Description BG – Background
 = 0.0 ppm

<u>Depth</u>	<u>Description</u>	<u>PID (ppm)</u>
0'	Unpaved gravel parking area; frost is down to 16" (1.33')	BG
0' - 2.33'	Dry, tan, <u>coarse to medium gravel</u> , some cobbles, and medium to coarse sand. Clast-supported, rounded to well-rounded gravel and cobbles. Fill.	0.4
2.33' - 3.25'	Moist, grey and brown, <u>coarse to medium gravel</u> ; some fine to medium sand; little cobbles, silt. Finer grained between clasts; still clast-supported. Rust-colored mottles, oily surface to gravel. Oil odor!	(2.4') 1.2 (2.8') 3.0 (3.2') 7.4
3.25' - > 4.8'	Moist to wet, tan and dark grey where oily; <u>coarse to medium gravel</u> ; some medium to coarse sand; little cobbles. Clast-supported. Strong oil odor. Water @ 4.8' depth - sheen on water.	(3.6') 4.4 (4.0') 10.2 (4.4') 10.2
	Excavate to 5.6', below ground water are black, oil-covered gravel and cobbles with a strong oil odor.	(4.8') 12.6 (5.6') 32

TEST PIT LOG

TEST PIT: TP-2

LOCATION: Morse Property, Rte. 67A, Bennington, VT

EXCAVATOR: Burgess Brothers, Bennington, VT

HYDROGEOLOGIST: William Norland, Lincoln Applied Geology, Inc.

DATE: 1/11/94

Soils Description

BG – Background
= 0.0 ppm

<u>Depth</u>	<u>Description</u>	<u>PID (ppm)</u>
	Water at 5.5' depth, frost is 2.5' deep, and fuel oil odor from test pit and soils	
0' - 3'	Moist, brown and tan, <u>medium to coarse gravel</u> ; some medium to coarse sand; little cobbles, silt. Clast-supported. Fuel oil odor. Fill.	(3.0') 9.2 (3.5') 14.2
3' - >5.5'	Moist to wet, olive brown, <u>medium to coarse gravel</u> ; some fine to medium sand; little cobbles, silt; trace coarse sand. Strong fuel oil odor. Fill. Gravels from below water table are coated black with very strong fuel oil odor. Excavate to 6.0' <u>Black</u> soils same as above, more sandy. Oil covers cobbles, gravel. Free product drops on water surface, sheen.	(4.0') 16.8 (4.5') 17.2 (5.0') 52 (6.0') 82

TEST PIT LOG

TEST PIT: TP-3

LOCATION: Morse Property, Rte. 67A, Bennington, VT

EXCAVATOR: Burgess Brothers, Bennington, VT

HYDROGEOLOGIST: William Norland, Lincoln Applied Geology, Inc.

DATE: 1/11/94

Soils Description

BG = Background
- 0.0 ppm

<u>Depth</u>	<u>Description</u>	<u>PID (ppm)</u>
	Frost is 2.67' deep.	
0' - 3.17'	Dry, tan brown, <u>medium to coarse gravel</u> ; some fine to coarse sand; little cobbles.	
3.17' - 4.83'	Moist, olive tan, <u>fine sand</u> ; little medium sand, silt.	(3.17') 1.0
4.83' -> 5.5'	Moist to wet, olive tan, and grey, <u>fine to coarse gravel</u> ; some medium to coarse sand, little cobbles, fine sand.	(3.5') 0.8 (4.17') 0.6
	Excavate to 6.0' collect sample.	(4.67') 0.6
	Water at 5.5' depth.	(5.17')
	Slight sheen, no strong odors, only very faint fuel oil odor.	0.6

TEST PIT LOG

TEST PIT: TP-4

LOCATION: Morse Property, Rte. 67A, Bennington, VT

EXCAVATOR: Burgess Brothers, Bennington, VT

HYDROGEOLOGIST: William Norland, Lincoln Applied Geology, Inc.

DATE: 1/11/94

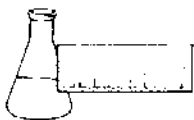
Soils Description

BG = Background
= 0.0 ppm

<u>Depth</u>	<u>Description</u>	<u>PID (ppm)</u>
	Frost about 1.5 feet deep.	
0' - 3.33'	Dry, tan to rust brown, <u>coarse to medium gravel</u> ; some cobbles and medium to coarse sand; little fine sand. Nested, clast-supported.	0.6
3.33' - 4.33'	Moist, grey, <u>fine sand and silt</u> ; little medium sand.	3.5
4.33' - 5.0'	Moist to wet, tan brown, <u>medium to coarse sand</u> ; little fine gravel.	54
>5.0'	Wet, black, <u>coarse to medium gravel</u> ; some medium to coarse sand, cobbles. Water at 5' depth - heavy sheen on water, Free product droplets. Excavate to 6.0'	52

APPENDIX C

Soil and Oil Laboratory Reports



ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

REPORT OF LABORATORY ANALYSIS

CLIENT: Lincoln Applied Geology
PROJECT NAME: Morse Property
DATE REPORTED: January 25, 1994
DATE SAMPLED: January 11, 1994

PROJECT CODE: LAMO1655
REF. #: 55,823 - 55,825

Enclosed please find the results of the analyses performed for the samples referenced on the attached chain of custody record.

Chain of custody indicated no sample preservation.

All samples were prepared and analyzed by requirements outlined in the referenced methods and within the specified holding times.

All instrumentation was calibrated with the appropriate frequency and verified by the requirements outlined in the referenced methods.

Blank contamination was not observed at levels affecting the analytical results.

Analytical method precision and accuracy was monitored by laboratory control standards which included matrix spike, duplicate and quality control analyses. These standards were determined to be within established laboratory method acceptance limits.

Individual sample performance was monitored by the addition of surrogate analytes to each sample. All surrogate data was determined to be within Laboratory QA/QC guidelines unless otherwise noted.

Reviewed by,

Harry B. Locker, Ph.D.
Laboratory Director

APPLIED GEOLOGY, INC.

enclosures



ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

EPA METHOD 8080 -- AROCHLORS (OIL)

CLIENT: Lincoln Applied Geology
PROJECT NAME: Morse Property
REPORT DATE: January 25, 1994
SAMPLER: Bill Norland
DATE SAMPLED: January 11, 1994
DATE RECEIVED: January 13, 1994

PROJECT CODE: LAMO1655
ANALYSIS DATE: January 20, 1994
STATION: MW-7
REF. #: 55,823
TIME SAMPLED: 9:30

<u>Parameter</u>	<u>Detection Limit (ug/L)</u>	<u>Concentration (ug/L)¹</u>
Arochlor-1016	20,000	ND ²
Arochlor-1221	20,000	ND
Arochlor-1232	20,000	ND
Arochlor-1242	20,000	ND
Arochlor-1248	20,000	ND
Arochlor-1254	20,000	64,200.
Arochlor-1260	20,000	ND
Unspecified PCB	20,000	ND

Analytical Surrogate Recovery:

Dibutylchloroendate: NS³
Octachloronaphthalene: NS

NOTES:

- 1 Values reported on weight/volume basis for free product portion of sample only.
- 2 None detected.
- 3 No extraction was performed negating the use of surrogates.



ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

EPA METHOD 8080 -- AROCHLORS (SOIL)

CLIENT: Lincoln Applied Geology
PROJECT NAME: Morse Property
REPORT DATE: January 25, 1994
SAMPLER: Bill Norland
DATE SAMPLED: January 11, 1994
DATE RECEIVED: January 13, 1994
DATE EXTRACTED: January 14, 1994

PROJECT CODE: LAMO1655
ANALYSIS DATE: January 20, 1994
STATION: TP-1 2.4'-3.0'
REF. #: 55,824
TIME SAMPLED: 10:55

<u>Parameter</u>	<u>Detection Limit (ug/kg)</u>	<u>Concentration</u> <u>(ug/kg) as received</u>
Arochlor-1016	150	ND ¹
Arochlor-1221	150	ND
Arochlor-1232	150	ND
Arochlor-1242	150	ND
Arochlor-1248	150	ND
Arochlor-1254	150	384.
Arochlor-1260	150	ND
Unspecified PCB	150	ND

PERCENT SOLIDS: 80%

Analytical Surrogate Recovery:

Dibutylchlorodate:

DO²

Octachloronaphthalene:

DO

NOTES:

- 1 None detected
- 2 Surrogates diluted out of analytical range.



ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

EPA METHOD 8080 -- AROCHLORS (SOIL)

CLIENT: Lincoln Applied Geology
PROJECT NAME: Morse Property
REPORT DATE: January 25, 1994
SAMPLER: Bill Norland
DATE SAMPLED: January 11, 1994
DATE RECEIVED: January 13, 1994
DATE EXTRACTED: January 14, 1994

PROJECT CODE: LAMO1655
ANALYSIS DATE: January 20, 1994
STATION: TP-1 4.2'-4.8'
REF. #: 55,825
TIME SAMPLED: 11:15

<u>Parameter</u>	<u>Detection Limit (ug/kg)</u>	<u>Concentration</u> <u>(ug/kg) as received</u>
Arochlor-1016	400	ND ¹
Arochlor-1221	400	ND
Arochlor-1232	400	ND
Arochlor-1242	400	ND
Arochlor-1248	400	ND
Arochlor-1254	400	1,450.
Arochlor-1260	400	ND
Unspecified PCB	400	ND

PERCENT SOLIDS: 93%

Analytical Surrogate Recovery:

Dibutylchloroendate:

DO²

Octachloronapthalene:

DO

NOTES:

- 1 None detected
- 2 Surrogates diluted out of analytical range.



≡ENDYNE, INC.

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333

CHAIN-OF-CUSTODY RECORD

09712

Project Name: <i>Morse Property</i>	Reporting Address: <i>Lincoln Applied Geology</i>	Billing Address: <i>same</i>
Site Location: <i>Bennington, VT</i>	<i>RD 1 Box 710 Bristol, VT 05443</i>	
Endyne Project Number: <i>LAM01655</i>	Company: <i>- same -</i>	Sampler Name: <i>Bill Norland</i>
	Contact Name/Phone #: <i>Bill Norland 453-4384</i>	Phone #: <i>453-4384</i>

[illegible]

Relinquished by: Signature <i>William Norland</i>	Received by: Signature <i>J M Wotmore</i>	Date/Time <i>Boh Mines 1-13-94 8:15</i>
Relinquished by: Signature <i>Boh Mines</i>	Received by: Signature	Date/Time <i>1/13/94 1:15 AM</i>

Requested Analyses

Requested Analyses											
1	pH	6	TKN	11	Total Solids	16	Metals (Specify)	21	EPA 624	26	EPA 8270 B/N or Acid
2	Chloride	7	Total P	12	TSS	17	Coliform (Specify)	22	EPA 625 B/N or A	27	EPA 8010/8020
3	Ammonia N	8	Total Diss. P	13	TDS	18	COD	23	EPA 418.1	28	EPA 8080 Pests/PCB
4	Nitrite N	9	BOD ₅	14	Turbidity	19	BTEX	24	EPA 608 Pests/PCB		
5	Nitrate N	10	Alkalinity	15	Conductivity	20	EPA 601/602	25	EPA 8240		
29	TCLP (Specify: volatiles, semi-volatiles, metals, pesticides, herbicides)										
30	Other (Specify):										

APPENDIX D

Detailed Well Logs

WELL LOG

WELL: MW-10

LOCATION: Morse Property, Rte. 67A, Bennington, VT (at corner of property Rte. near 67A and Johnson Controls Road)

DRILLER: Tri-State Drilling and Boring, Inc., West Burke, VT

HYDROGEOLOGIST: William Norland, Lincoln Applied Geology, Inc.

DATE: 1/19/94

Soils Description

BG = Background =
0.0 ppm

<u>Depth</u>	<u>Description</u>	<u>PID (ppm)</u>
0'	Snow over frozen, unpaved parking area. Frost is about 1.5' deep.	
2' - 4'	6" - Dry, tan, <u>silt</u> ; some very fine sand. 18" - Dry to moist, tan brown to brown at base, <u>silt</u> ; some very fine sand; trace fine gravel.	3.4
4' - 6'	Moist, brown, <u>silt</u> ; some very fine sand; trace fine gravel, marsh organics (black) 3" from bottom.	4.1
6' - 8'	3" - Wet, brown, <u>silt</u> ; some very fine sand. 2" - Wet, buff, <u>coarse gravel</u> (limestone), little medium to coarse sand.	2.9
8' - 10'	Wet, olive brown, <u>medium to coarse gravel</u> ; some medium to coarse sand; little fine gravel, fine sand.	3.4
10' - 12'	Heaving gravels and sand into auger - no sample. Drill to 14' depth, install well.	

Well Construction

Bottom of Boring:	14'
Bottom of Well:	13'
Well Screen:	10': 2" PVC, Sch. 40, 0.020" slot (3' - 13')
Solid Riser:	2.5': 2" PVC, Sch. 40 (0.5' - 3')
Sand Pack:	12' (2' - 14')
Bentonite Seal:	1' (1' - 2')
Backfill:	None
Well Box:	Flush mounted

WELL LOG

WELL: MW-11

LOCATION: Morse Property, Rte. 67A, Bennington, VT (beside W. Morse building)

DRILLER: Tri-State Drilling and Boring, Inc., West Burke, VT

HYDROGEOLOGIST: William Norland, Lincoln Applied Geology, Inc.

DATE: 1/19/94

Soils Description

BG – Background = 0.0 ppm

<u>Depth</u>	<u>Description</u>	<u>PID (ppm)</u>
0'	Snow and unpaved parking, sand and gravel area. Frost down to about 1.5'	
2' - 4'	Dry, tan, <u>fine to coarse sand</u> ; little fine to medium gravel. Fill. (Had to move rig again 5' toward Rt. 67A. Boulders - fill from Walloomsac River says Morse.)	BG
4' - 5.25'	Moist to wet, tan, <u>fine to coarse sand</u> ; some fine to coarse gravel; trace silt.	3.9
6' - 8'	Wet, olive brown, <u>fine to coarse sand</u> ; some fine to medium gravel.	0.5
8' - 9'	Same as above, no sample collected.	
10' - 11.5'	Wet, olive brown, <u>medium to coarse sand</u> ; some fine gravel; little fine sand, medium gravel.	0.7
	Drill to 14', install well.	

Well Construction

Bottom of Boring:	14'
Bottom of Well:	13'
Well Screen:	10': 2" PVC, Sch. 40, 0.020" slot (3' - 13')
Solid Riser:	2.5': 2" PVC, Sch. 40 (0.5' - 3')
Sand Pack:	11' (2' - 13')
Bentonite Seal:	1' (1' - 2')
Backfill:	None
Well Box:	One flush mounted

SOIL PROBE LOG

Page 1 of 2
MW # 10
Morse Property
N. Bennington, VT

TRI STATE
DRILLING & BORING, INC.
P.O. #2, Box 113 West Burke, VT 05871
(802) 467-3120

		SAMPLE	SOIL
		Continuous	Saturated
TYPE	4SA	SS	Wet
SIZE	2"		Moist
HAMMER	14MM		Damp
FALL	30"		Slightly Damp

DATE STARTED: 01/12/94

DATE COMPLETED: 01/12/94

FOOTAGE			
DEPTH	BLOW COUNTS PER	DRILLER'S NOTES & COMMENTS	

6.12 0.04

..2-4'...	10	6	6	124"	Dry.	tan and gray silty fine sands, over brown silty fine sands.
..4-6'...	17	7	7	112"	Moist.	Medium brown silt with very fine sands.
..6-8'...	9	8	11	91.5"	Sat'd.	3" brown silty fine sands over 2" medium gravel.
..8-10'...	4	7	9	1710"	Sat'd.	Dark brown medium/coarse sands and fine to coarse gravel.
						Auger to 13', set well.
						Screen 13' to 3' below GS.
						Riser to surface.
						Sandpack 13' to 2' below GS.
						Benseal.
						Install road box.

Client: Morse Property
Job Location: N. Bennington, VT
Engineer: Lincoln Applied Geology
Bristol, VT
Inspector: Bill Norland

Driller: Edward Westover
Helper: Hank Dawson
Materials: 10' screen, 3' riser,
2 caps, 3 sand, 1/2 bentonite
1 road box.

SOIL PROBE LOG

Page 2 of 2

MW # 11

Morse Property

N. Bennington, VT

TRI STATE
DRILLING & DORRINS, INC.
RFD #2, Box 113 West Burke, VT 05871
(802) 467-3123

TYPE	HSA	SAMPLER	SOIL
SIZE	2"	Cond. Index	Saturated
HAMMER	140#		Wet
FALL	30"		Moist
			Damp
			Slightly Damp

DATE STARTED: 01/19/94

DATE COMPLETED: 01/19/94

FOOTAGE

DEPTH BLOW COUNTS RCP

DRILLER'S NOTES & COMMENTS

6 12 18 24

.....	.....	.....	.....	.....	.....	Auger refusal 1', move ahead, try again.
.....	
2-4'	11	15	100/3"	12"	Wet.	(Fill) brown fine to coarse sands and small pebbles.
.....	
.....	
.....	.....	.....	.....	.....	.....	Auger refusal 2'6", move over 5', try again. Auger refusal 2'6", move, try again.
.....	
4-6'	11	15	100/3"	12"	Wet.	Brown fine/coarse sands medium/small gravel.
.....	
6-8'	16	18	21	13	15" Sat'd.	Same.
.....	
8-10'	23	27	.....	.....	Sat'd.	Same.
.....	
10-12'	12	14	11	.....	Sat'd.	Same.
.....	
.....	.....	.....	.....	.....	.....	Auger to 13', set well.
.....	
.....	.....	.....	.....	.....	.....	Screen 13' to 3' below GS.
.....	.....	.....	.....	.....	.....	Riser to surface.
.....	.....	.....	.....	.....	.....	Sandpack 13' to 2' below GS.
.....	.....	.....	.....	.....	.....	Benseal 2' to 1' below GS.
.....	.....	.....	.....	.....	.....	Install road box.

Client: Morse Property
Job Location: N. Bennington, VT
Engineer: Lincoln Applied Geology
Bristol, VT
Inspector: Bill Norland

Driller: Edward Westover
Helper: Hank Dawson
Materials: 10' screen, 3' riser,
2 caps, 3 sand, 1/2 bentonite
1 road box.

APPENDIX E

Water Quality Laboratory Reports



APPLIED GEOLOGY

LABORATORY ANALYSIS

CLIENT NAME:	Lincoln Applied Geology	REF #:	8165
ADDRESS:	RD#1 Box 710 Bristol, VT 05443	PROJECT NO.:	not given
SAMPLE LOCATION:	Morse Property	DATE OF SAMPLE:	1/25/94
SAMPLER:	Jim Holman	DATE OF RECEIPT:	1/26/94
		DATE OF ANALYSIS:	2/4,2/5,2/6,2/7/94
ATTENTION:	John Amadon/ Bill Norland	DATE OF REPORT:	2/8/94

Pertaining to the analyses of specimens submitted under the accompanying chain of custody form, please note the following:

- Water samples submitted for VOC analysis were preserved with HCl.
- Specimens were processed and examined according to the procedures outlined in the specified method.
- Holding times were honored.
- Instruments were appropriately tuned and calibrations were checked with the frequencies required in the specified method.
- Blank contamination was not observed at levels interfering with the analytical results.
- Continuing calibration standards were monitored at intervals indicated in the specified method. The resulting analytical precision and accuracy were determined to be within method QA/QC acceptance limits.
- The inferred efficiency of analyte recovery for individual samples was monitored by the addition of surrogate analytes to all samples, standards, and blanks. Surrogate recoveries were found to be within laboratory QA/QC acceptance limits, unless noted otherwise.

Reviewed by:

Brendan McMahon, Ph.D.
Director, Chemical Services



LABORATORY REPORT

GC/MS METHOD - BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES) + MTBE

CLIENT NAME:	Lincoln Applied Geology	PROJECT CODE:	not given
PROJECT NAME:	Morse Property	REF.#:	8,165
REPORT DATE:	February 8, 1994	STATION:	MW-1
DATE SAMPLED:	January 25, 1994	TIME SAMPLED:	12:51
DATE RECEIVED:	January 26, 1994	SAMPLER:	Jim Holman
ANALYSIS DATE:	February 5, 1994	SAMPLE TYPE:	Water

PARAMETER	PQL (µg/L)	Concentration (µg/L)
Benzene	1	BPQL
Toluene	1	BPQL
Ethylbenzene	1	BPQL
Xylenes	3	BPQL
MTBE	1	BPQL

Surrogate % Recovery: 100%

BPQL = Below Practical Quantitation Limit (PQL).



LABORATORY REPORT

GC/MS METHOD - BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES) + MTBE

CLIENT NAME:	Lincoln Applied Geology	PROJECT CODE:	not given
PROJECT NAME:	Morse Property	REF.#:	8,165
REPORT DATE:	February 8, 1994	STATION:	MW-2
DATE SAMPLED:	January 25, 1994	TIME SAMPLED:	11:15
DATE RECEIVED:	January 26, 1994	SAMPLER:	Jim Holman
ANALYSIS DATE:	February 4, 1994	SAMPLE TYPE:	Water

PARAMETER	PQL ($\mu\text{g/L}$)	Concentration ($\mu\text{g/L}$)
Benzene	1	BPQL
Toluene	1	BPQL
Ethylbenzene	1	BPQL
Xylenes	3	BPQL
MTBE	1	BPQL

Surrogate % Recovery: 100%

BPQL = Below Practical Quantitation Limit (PQL).



LABORATORY REPORT

GC/MS METHOD - BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES) + MTBE

CLIENT NAME:	Lincoln Applied Geology	PROJECT CODE:	not given
PROJECT NAME:	Morse Property	REF. #:	8,165
REPORT DATE:	February 8, 1994	STATION:	MW-3
DATE SAMPLED:	January 25, 1994	TIME SAMPLED:	11:25
DATE RECEIVED:	January 26, 1994	SAMPLER:	Jim Holman
ANALYSIS DATE:	February 4, 1994	SAMPLE TYPE:	Water

PARAMETER	PQL (µg/L)	Concentration (µg/L)
Benzene	1	BPQL
Toluene	1	BPQL
Ethylbenzene	1	BPQL
Xylenes	3	BPQL
MTBE	1	BPQL

Surrogate % Recovery: 100%

BPQL = Below Practical Quantitation Limit (PQL).



LABORATORY REPORT

GC/MS METHOD - BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES) + MTBE

CLIENT NAME:	Lincoln Applied Geology	PROJECT CODE:	not given
PROJECT NAME:	Morse Property	REF.#:	8,165
REPORT DATE:	February 8, 1994	STATION:	MW-4
DATE SAMPLED:	January 25, 1994	TIME SAMPLED:	11:37
DATE RECEIVED:	January 26, 1994	SAMPLER:	Jim Holman
ANALYSIS DATE:	February 4, 1994	SAMPLE TYPE:	Water

PARAMETER	PQL (µg/L)	Concentration (µg/L)
Benzene	1	BPQL
Toluene	1	BPQL
Ethylbenzene	1	BPQL
Xylenes	3	BPQL
MTBE	1	BPQL

Surrogate % Recovery: 100%

BPQL = Below Practical Quantitation Limit (PQL).



LABORATORY REPORT

GC/MS METHOD - BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES) + MTBE

CLIENT NAME:	Lincoln Applied Geology	PROJECT CODE:	not given
PROJECT NAME:	Morse Property	REF.#:	8,165
REPORT DATE:	February 8, 1994	STATION:	MW-5
DATE SAMPLED:	January 25, 1994	TIME SAMPLED:	11:47
DATE RECEIVED:	January 26, 1994	SAMPLER:	Jim Holman
ANALYSIS DATE:	February 4, 1994	SAMPLE TYPE:	Water

PARAMETER	PQL ($\mu\text{g/L}$)	Concentration ($\mu\text{g/L}$)
Benzene	1	BPQL
Toluene	1	BPQL
Ethylbenzene	1	BPQL
Xylenes	3	BPQL
MTBE	1	BPQL

Surrogate % Recovery: 100%

BPQL = Below Practical Quantitation Limit (PQL).



LABORATORY REPORT

GC/MS METHOD - BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES) + MTBE

CLIENT NAME:	Lincoln Applied Geology	PROJECT CODE:	not given
PROJECT NAME:	Morse Property	REF.#:	8,165
REPORT DATE:	February 8, 1994	STATION:	MW-6
DATE SAMPLED:	January 25, 1994	TIME SAMPLED:	13:07
DATE RECEIVED:	January 26, 1994	SAMPLER:	Jim Holman
ANALYSIS DATE:	February 7, 1994	SAMPLE TYPE:	Water

PARAMETER	PQL (µg/L)	Concentration (µg/L)
Benzene	1	12
Toluene	1	BPQL
Ethylbenzene	1	BPQL
Xylenes	3	3
MTBE	1	BPQL

Surrogate % Recovery: 100%

BPQL = Below Practical Quantitation Limit (PQL).



LABORATORY REPORT

GC/MS METHOD - BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES) + MTBE

CLIENT NAME:	Lincoln Applied Geology	PROJECT CODE:	not given
PROJECT NAME:	Morse Property	REF.#:	8,165
REPORT DATE:	February 8, 1994	STATION:	MW-7
DATE SAMPLED:	January 25, 1994	TIME SAMPLED:	13:20
DATE RECEIVED:	January 26, 1994	SAMPLER:	Jim Holman
ANALYSIS DATE:	February 7, 1994	SAMPLE TYPE:	Water

PARAMETER	PQL (µg/L)	Concentration (µg/L)
Benzene	1	BPQL
Toluene	1	BPQL
Ethylbenzene	1	BPQL
Xylenes	3	18
MTBE	1	BPQL

Surrogate % Recovery: 100%

BPQL = Below Practical Quantitation Limit (PQL).



LABORATORY REPORT

GC/MS METHOD - BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES) + MTBE

CLIENT NAME:	Lincoln Applied Geology	PROJECT CODE:	not given
PROJECT NAME:	Morse Property	REF.#:	8,165
REPORT DATE:	February 8, 1994	STATION:	MW-8
DATE SAMPLED:	January 25, 1994	TIME SAMPLED:	11:55
DATE RECEIVED:	January 26, 1994	SAMPLER:	Jim Holman
ANALYSIS DATE:	February 4, 1994	SAMPLE TYPE:	Water

PARAMETER	PQL (µg/L)	Concentration (µg/L)
Benzene	1	BPQL
Toluene	1	BPQL
Ethylbenzene	1	BPQL
Xylenes	3	BPQL
MTBE	1	BPQL

Surrogate % Recovery: 100%

BPQL = Below Practical Quantitation Limit (PQL).



LABORATORY REPORT

GC/MS METHOD - BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES) + MTBE

CLIENT NAME:	Lincoln Applied Geology	PROJECT CODE:	not given
PROJECT NAME:	Morse Property	REF.#:	8,165
REPORT DATE:	February 8, 1994	STATION:	MW-9
DATE SAMPLED:	January 25, 1994	TIME SAMPLED:	12:09
DATE RECEIVED:	January 26, 1994	SAMPLER:	Jim Holman
ANALYSIS DATE:	February 4, 1994	SAMPLE TYPE:	Water

PARAMETER	PQL ($\mu\text{g/L}$)	Concentration ($\mu\text{g/L}$)
Benzene	1	BPQL
Toluene	1	BPQL
Ethylbenzene	1	BPQL
Xylenes	3	BPQL
MTBE	1	BPQL

Surrogate % Recovery: 100%

BPQL = Below Practical Quantitation Limit (PQL).



LABORATORY REPORT

GC/MS METHOD - BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES) + MTBE

CLIENT NAME:	Lincoln Applied Geology	PROJECT CODE:	not given
PROJECT NAME:	Morse Property	REF.#:	8,165
REPORT DATE:	February 8, 1994	STATION:	MW-10
DATE SAMPLED:	January 25, 1994	TIME SAMPLED:	12:20
DATE RECEIVED:	January 26, 1994	SAMPLER:	Jim Holman
ANALYSIS DATE:	February 4, 1994	SAMPLE TYPE:	Water

PARAMETER	PQL (µg/L)	Concentration (µg/L)
Benzene	1	BPQL
Toluene	1	3
Ethylbenzene	1	BPQL
Xylenes	3	6
MTBE	1	BPQL

Surrogate % Recovery: 100%

BPQL = Below Practical Quantitation Limit (PQL).



LABORATORY REPORT

GC/MS METHOD - BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES) + MTBE

CLIENT NAME:	Lincoln Applied Geology	PROJECT CODE:	not given
PROJECT NAME:	Morse Property	REF.#:	8,165
REPORT DATE:	February 8, 1994	STATION:	MW-11
DATE SAMPLED:	January 25, 1994	TIME SAMPLED:	12:45
DATE RECEIVED:	January 26, 1994	SAMPLER:	Jim Holman
ANALYSIS DATE:	February 4, 1994	SAMPLE TYPE:	Water

PARAMETER	PQL (µg/L)	Concentration (µg/L)
Benzene	1	BPQL
Toluene	1	BPQL
Ethylbenzene	1	BPQL
Xylenes	3	BPQL
MTBE	1	BPQL

Surrogate % Recovery: 99%

BPQL = Below Practical Quantitation Limit (PQL).



LABORATORY REPORT

GC/MS METHOD - BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES) + MTBE

CLIENT NAME:	Lincoln Applied Geology	PROJECT CODE:	not given
PROJECT NAME:	Morse Property	REF.#:	8,165
REPORT DATE:	February 8, 1994	STATION:	B.A. Motel/Apt. DW Well
DATE SAMPLED:	January 25, 1994	TIME SAMPLED:	12:30
DATE RECEIVED:	January 26, 1994	SAMPLER:	Jim Holman
ANALYSIS DATE:	February 4, 1994	SAMPLE TYPE:	Water

PARAMETER	PQL (µg/L)	Concentration (µg/L)
Benzene	1	BPQL
Toluene	1	BPQL
Ethylbenzene	1	BPQL
Xylenes	3	BPQL
MTBE	1	BPQL

Surrogate % Recovery: 100%

BPQL = Below Practical Quantitation Limit (PQL).



LABORATORY REPORT

GC/MS METHOD - BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES) + MTBE

CLIENT NAME:	Lincoln Applied Geology	PROJECT CODE:	not given
PROJECT NAME:	Morse Property	REF.#:	8,165
REPORT DATE:	February 8, 1994	STATION:	Trip Blank
DATE SAMPLED:	January 25, 1994	TIME SAMPLED:	06:30
DATE RECEIVED:	January 26, 1994	SAMPLER:	Jim Holman
ANALYSIS DATE:	February 4, 1994	SAMPLE TYPE:	Water

PARAMETER	PQL (µg/L)	Concentration (µg/L)
Benzene	1	BPQL
Toluene	1	BPQL
Ethylbenzene	1	BPQL
Xylenes	3	BPQL
MTBE	1	BPQL

Surrogate % Recovery: 100%

BPQL = Below Practical Quantitation Limit (PQL).

CHAIN OF CUSTODY RECORD



MicroAssays of Vermont

RR# Box 5210 P.O. Box 189
Montpelier, VT 05602
Ph. (802)223-1468 Fax (802)223-8688

ANALYSIS REQUESTED

Page

_ of _

MAV #

8165

CLIENT NAME

Lincoln Applied Geology, Inc.

ADDRESS

RD 1 Box 710, Bristol, VT 05443

PROJECT NAME

Morse Property, Bennington, VT

PROJECT NUMBER

PROJECT MANAGER

Bill Norland

SAMPLER

Jim Holman

BTEX & MTBE

Sample Location

Date

Time

of
cont.pres
ervdSample
Type

MW-3 ✓

1/25/94

1125

1

HCl

Water

MW-4 ✓

1/25/94

1137

1

HCl

Water

REMARKS:

Relinquished by:

Received by:

Date/Time

Relinquished by:

Received by:

Date/Time

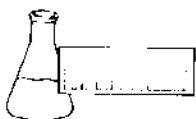
Bill Norland

Bob Hines

Bob Hines

D Bouchard

10:10 1-26-94



ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

REPORT OF LABORATORY ANALYSIS

CLIENT: Lincoln Applied Geology
PROJECT NAME: Morse Property
DATE REPORTED: March 16, 1994
DATE SAMPLED: March 7, 1994

PROJECT CODE: LAMP1978
REF. #: 57,026 - 57,029

Enclosed please find the results of the analyses performed for the samples referenced on the attached chain of custody record.

Chain of custody did not indicate sample preservation.

All samples were prepared and analyzed by requirements outlined in the referenced methods and within the specified holding times.

All instrumentation was calibrated with the appropriate frequency and verified by the requirements outlined in the referenced methods.

Blank contamination was not observed at levels affecting the analytical results.

Analytical method precision and accuracy was monitored by laboratory control standards which included matrix spike, duplicate and quality control analyses. These standards were determined to be within established laboratory method acceptance limits.

Individual sample performance was monitored by the addition of surrogate analytes to each sample. All surrogate data was determined to be within Laboratory QA/QC guidelines unless otherwise noted.

Reviewed by,

Harry B. Locker, Ph.D.
Laboratory Director

RECEIVED

MAR 19

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enclosures



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Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

EPA METHOD 608 -- AROCHLORS (WATER)

CLIENT: Lincoln Applied Geology
PROJECT NAME: Morse Property
REPORT DATE: March 16, 1994
SAMPLER: Jim Holman
DATE SAMPLED: March 7, 1994
DATE RECEIVED: March 7, 1994
DATE EXTRACTED: March 8, 1994

PROJECT CODE: LAMP1978
ANALYSIS DATE: March 9, 1994
STATION: Trip Blank
REF. #: 57,026
TIME SAMPLED: 7:45

<u>Parameter</u>	<u>Detection Limit (ug/L)</u>	<u>Concentration (ug/L)</u>
Arochlor-1016	2	ND ¹
Arochlor-1221	2	ND
Arochlor-1232	2	ND
Arochlor-1242	2	ND
Arochlor-1248	2	ND
Arochlor-1254	2	ND
Arochlor-1260	2	ND
Unspecified PCB	2	ND

Analytical Surrogate Recovery:

Dibutylchloroendate: 84.%
Octachloronaphthalene: 94.%

NOTES:

1 None detected

APPLIED GEOLOGY

APPLIED GEOLOGY



ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

EPA METHOD 608 -- AROCHLORS (WATER)

CLIENT: Lincoln Applied Geology
PROJECT NAME: Morse Property
REPORT DATE: March 16, 1994
SAMPLER: Jim Holman
DATE SAMPLED: March 7, 1994
DATE RECEIVED: March 7, 1994
DATE EXTRACTED: March 8, 1994

PROJECT CODE: LAMP1978
ANALYSIS DATE: March 9, 1994
STATION: MW-7
REF. #: 57,029
TIME SAMPLED: 7:45

<u>Parameter</u>	<u>Detection Limit (ug/L)¹</u>	<u>Concentration (ug/L)</u>
Arochlor-1016	10	ND ²
Arochlor-1221	10	ND
Arochlor-1232	10	ND
Arochlor-1242	10	ND
Arochlor-1248	10	ND
Arochlor-1254	10	ND
Arochlor-1260	10	ND
Unspecified PCB	10	40. ³

Analytical Surrogate Recovery:

Dibutylchloroendate: NR⁴
Octachloronaphthalene: NR

LINCOLN APPLIED GEOLOGY, INC.

NOTES:

- 1 Detection limit raised due to high level of non-target contaminants.
- 2 None detected
- 3 The chromatogram produced a signature characteristic of a PCB, however, there was no definitive match with an Arochlor in our library. Hence, the concentration is only an estimation based on the typical response of a PCB.
- 4 Not recovered. Surrogates were diluted out of analytical range.



ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

EPA METHOD 608 -- AROCHLORS (WATER)

CLIENT: Lincoln Applied Geology
PROJECT NAME: Morse Property
REPORT DATE: March 16, 1994
SAMPLER: Jim Holman
DATE SAMPLED: March 7, 1994
DATE RECEIVED: March 7, 1994
DATE EXTRACTED: March 8, 1994

PROJECT CODE: LAMP1978
ANALYSIS DATE: March 8, 1994
STATION: MW-8
REF. #: 57,028
TIME SAMPLED: 1:20

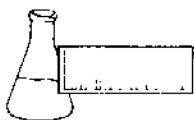
<u>Parameter</u>	<u>Detection Limit (ug/L)</u>	<u>Concentration (ug/L)</u>
Arochlor-1016	2	ND ¹
Arochlor-1221	2	ND
Arochlor-1232	2	ND
Arochlor-1242	2	ND
Arochlor-1248	2	ND
Arochlor-1254	2	ND
Arochlor-1260	2	ND
Unspecified PCB	2	ND

Analytical Surrogate Recovery:

Dibutylchloroendate: 92.%
Octachloronaphthalene: 123.%

NOTES:

1 None detected



ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

EPA METHOD 608 -- AROCHLORS (WATER)

CLIENT: Lincoln Applied Geology
PROJECT NAME: Morse Property
REPORT DATE: March 16, 1994
SAMPLER: Jim Holman
DATE SAMPLED: March 7, 1994
DATE RECEIVED: March 7, 1994
DATE EXTRACTED: March 8, 1994

PROJECT CODE: LAMP1978
ANALYSIS DATE: March 9, 1994
STATION: MW-11
REF. #: 57,027
TIME SAMPLED: 1:00

<u>Parameter</u>	<u>Detection Limit (ug/L)</u>	<u>Concentration (ug/L)</u>
Arochlor-1016	2	ND ¹
Arochlor-1221	2	ND
Arochlor-1232	2	ND
Arochlor-1242	2	ND
Arochlor-1248	2	ND
Arochlor-1254	2	ND
Arochlor-1260	2	ND
Unspecified PCB	2	ND

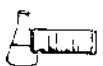
Analytical Surrogate Recovery:

Dibutylchloroendate: 95.%
Octachloronaphthalene: 104.%

NOTES:

1 None detected

LINCOLN APPLIED GEOLOGY, INC.



ENDYNE, INC.

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333

CHAIN-OF-CUSTODY RECORD

09723

Project Name: <u>MOOSE PROPERTY</u> Site Location: <u>N. GUNNINGTON VT.</u>	Reporting Address: <u>LAG</u> <u>RD. 1 BOX 710 BRISTOL VT.</u>	Billing Address: <u>SAME</u>
Endyne Project Number: <u>LAMP1478</u>	Company: <u>LAG</u> <u>BILL NORLAND</u> Contact Name/Phone #: <u>453-4384</u>	Sampler Name: <u>JIM HOLMAN</u> Phone #: <u>453-4384 LAG</u>

[illegible]

Relinquished by: Signature <i>Jim Ad</i>	Received by: Signature <i>James M. Chandler</i>	Date/Time <i>7/19/74</i>
Relinquished by: Signature	Received by: Signature	Date/Time

Requested Analyses

Requested Analyses											
1	pH	6	TKN	11	Total Solids	16	Metals (Specify)	21	EPA 624	26	EPA 8270 B/N or Acid
2	Chloride	7	Total P	12	TSS	17	Coliform (Specify)	22	EPA 625 B/N or A	27	EPA 8010/8020
3	Ammonia N	8	Total Diss. P	13	TDS	18	COD	23	EPA 418.1	28	EPA 8080 Pest/PCB
4	Nitrite N	9	BOD ₅	14	Turbidity	19	BTEX	24	EPA 608 Pest/PCB		
5	Nitrate N	10	Alkalinity	15	Conductivity	20	EPA 601/602	25	EPA 8240		
29	TCPLP (Specify: volatiles, semi-volatiles, metals, pesticides, herbicides)										
30	Other (Specify):										



LABORATORY ANALYSIS

FIELD GEOLOGY

CLIENT NAME:	Lincoln Applied Geology	REF #:	8112
ADDRESS:	RD#1 Box 710 Bristol, VT 05443	PROJECT NO.:	not given
SAMPLE LOCATION:	Morse Property, Bennington, VT	DATE OF SAMPLE:	1/11/94
SAMPLER:	Bill Norland	DATE OF RECEIPT:	1/12/94
		DATE OF ANALYSIS:	1/20/94
ATTENTION:	John Amadon/Bill Norland	DATE OF REPORT:	1/21/94

Pertaining to the analyses of specimens submitted under the accompanying chain of custody form, please note the following:

- Soil samples submitted for VOC analysis were not preserved but were stored at 4°C prior to analysis.
- Specimens were processed and examined according to the procedures outlined in the specified method.
- Holding times were honored.
- Instruments were appropriately tuned and calibrations were checked with the frequencies required in the specified method.
- Blank contamination was not observed at levels interfering with the analytical results.
- Continuing calibration standards were monitored at intervals indicated in the specified method. The resulting analytical precision and accuracy were determined to be within method QA/QC acceptance limits.
- The inferred efficiency of analyte recovery for individual samples was monitored by the addition of surrogate analytes to all samples, standards, and blanks. Surrogate recoveries were found to be within laboratory QA/QC acceptance limits, unless noted otherwise.

Reviewed by:

Brendan McMahon, Ph.D.
Director, Chemical Services



LABORATORY REPORT

GC/MS METHOD - BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES) + MTBE

CLIENT NAME:	Lincoln Applied Geology	PROJECT CODE:	not given
PROJECT NAME:	Morse Property, Bennington, VT	REF. #:	8,112
REPORT DATE:	January 21, 1994	STATION:	TP-1 2.4'-3.0'
DATE SAMPLED:	January 11, 1994	TIME SAMPLED:	10:55
DATE RECEIVED:	January 12, 1994	SAMPLER:	Bill Norland
ANALYSIS DATE:	January 20, 1994	SAMPLE TYPE:	Soil (82% Dry Wt.)

PARAMETER	PQL (µg/Kg dry wt.)	Concentration (µg/Kg dry wt.)
Benzene	122*	BPQL
Toluene	122	BPQL
Ethylbenzene	122	BPQL
Xylenes	366	BPQL
MTBE	122	BPQL

Surrogate % Recovery: 98%

BPQL = Below Practical Quantitation Limit (PQL).

*Note: The abundance of high molecular weight compounds prevents interference-free analysis at lower dilutions.

Chromatogram Plot

C:\SATURN\DATA\8112TP1S

Date: 01/20/94 01:49:27

Comment: 8112 (LAG)TP1 S 1:500

Scan No: 1

Retention Time: 0.01

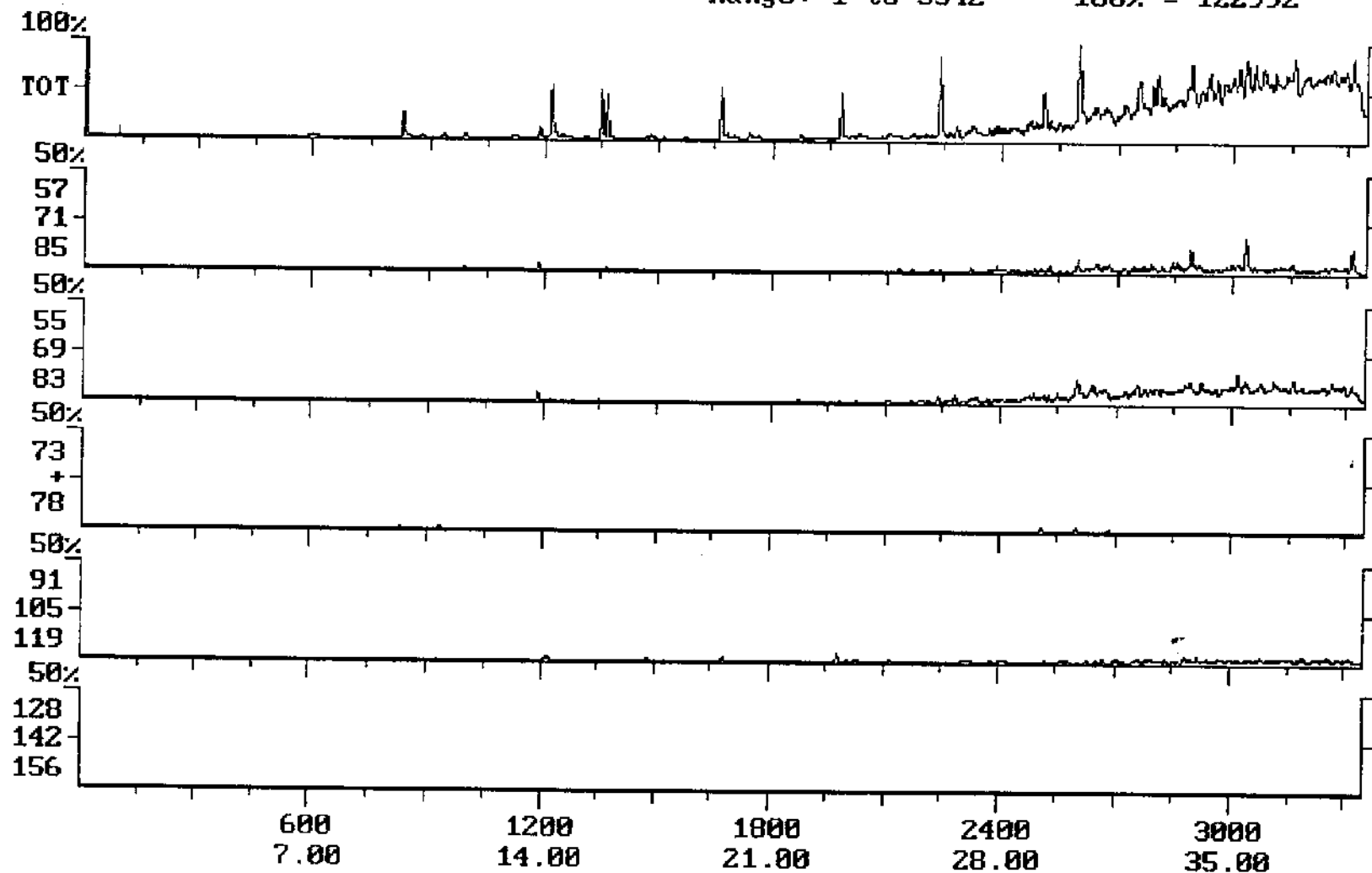
RIC: 0

Mass Range: 0 - 0

Plotted: 1 to 3342

Range: 1 to 3342

100% = 122992



Chromatogram Plot

C:\SATURN\DATA\8112TP1S

Date: 01/20/94 01:49:27

Comment: 8112 (LAG)TP1 S 1:500

Scan No: 1

Retention Time: 0.01

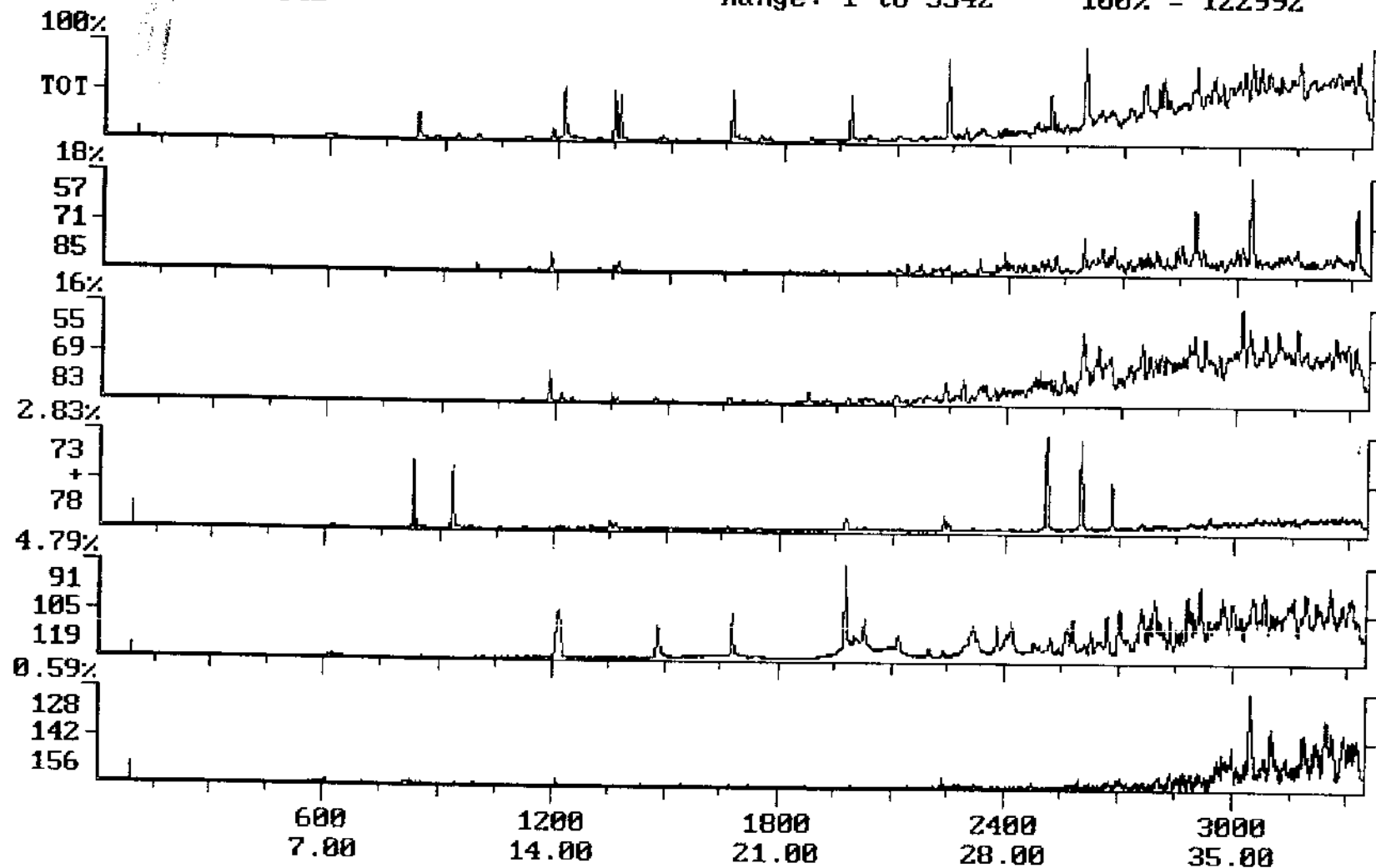
RIC: 0

Mass Range: 0 - 0

Plotted: 1 to 3342

Range: 1 to 3342

100% = 122992





LABORATORY REPORT

GC/MS METHOD - BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES) + MTBE

CLIENT NAME:	Lincoln Applied Geology	PROJECT CODE:	not given
PROJECT NAME:	Morse Property, Bennington, VT	REF.#:	8,112
REPORT DATE:	January 21, 1994	STATION:	TP-1 4.2'-4.8'
DATE SAMPLED:	January 11, 1994	TIME SAMPLED:	11:55
DATE RECEIVED:	January 12, 1994	SAMPLER:	Bill Norland
ANALYSIS DATE:	January 20, 1994	SAMPLE TYPE:	Soil (93% Dry Wt.)

PARAMETER	PQL (µg/Kg dry wt.)	Concentration (µg/Kg dry wt.)
Benzene	108*	BPQL
Toluene	108	BPQL
Ethylbenzene	108	BPQL
Xylenes	323	968
MTBE	108	BPQL

Surrogate % Recovery: 94%

BPQL = Below Practical Quantitation Limit (PQL).

*Note: The abundance of high molecular weight compounds prevents interference-free analysis at lower dilutions.

Chromatogram Plot

C:\SATURN\DATA\B112TP1D

Date: 01/20/94 02:44:03

Comment: 8112 (LAG)TP1 D 1:500

Scan No: 1

Retention Time: 0.00

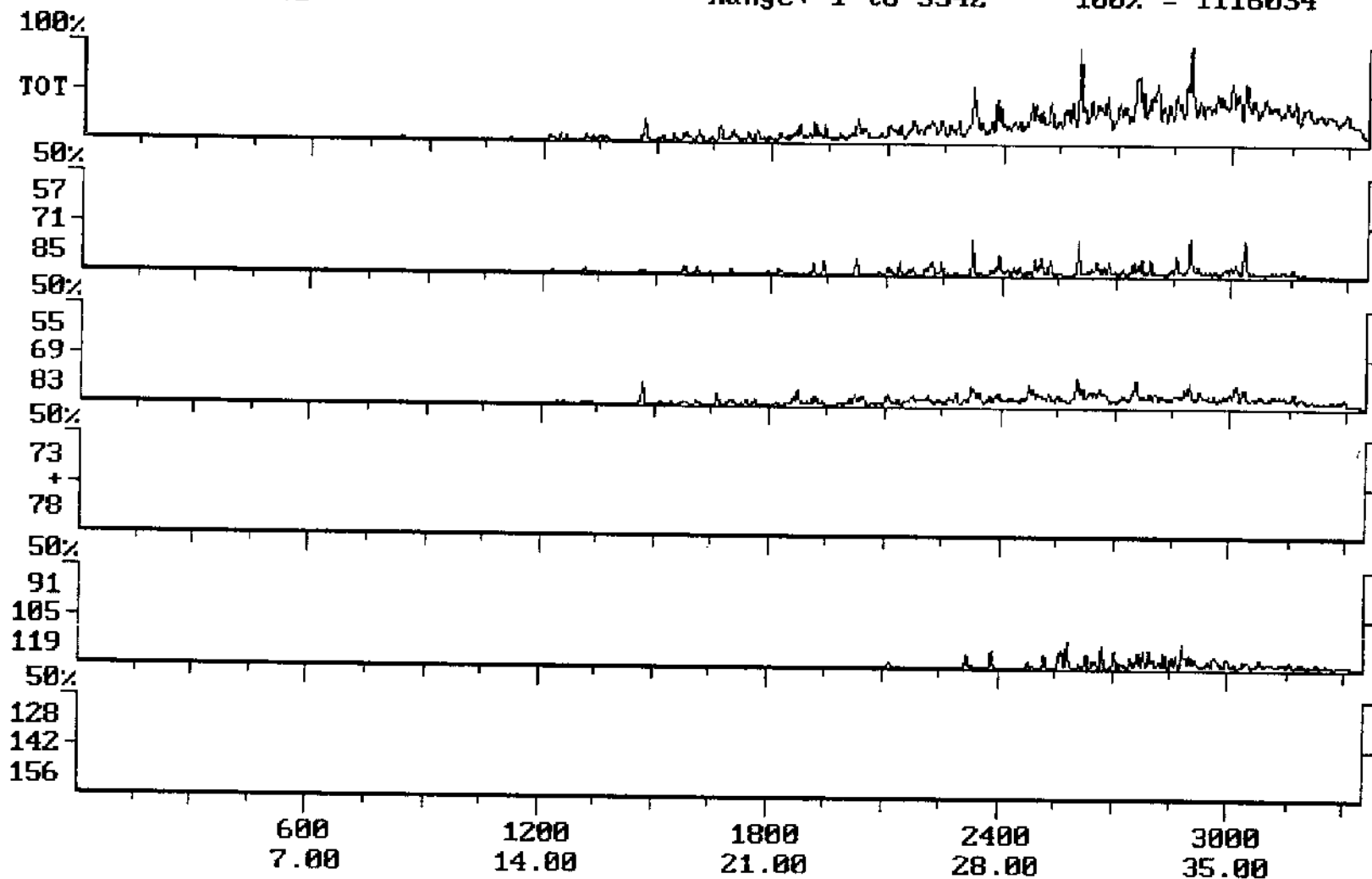
RIC: 0

Mass Range: 0 - 0

Plotted: 1 to 3342

Range: 1 to 3342

100% = 1116034



Chromatogram Plot

C:\SATURN\DATA\8112TP4

Date: 01/20/94 03:42:28

Comment: 8112 (LAG) TP4 1:\$00

Scan No: 1

Retention Time: 0.01

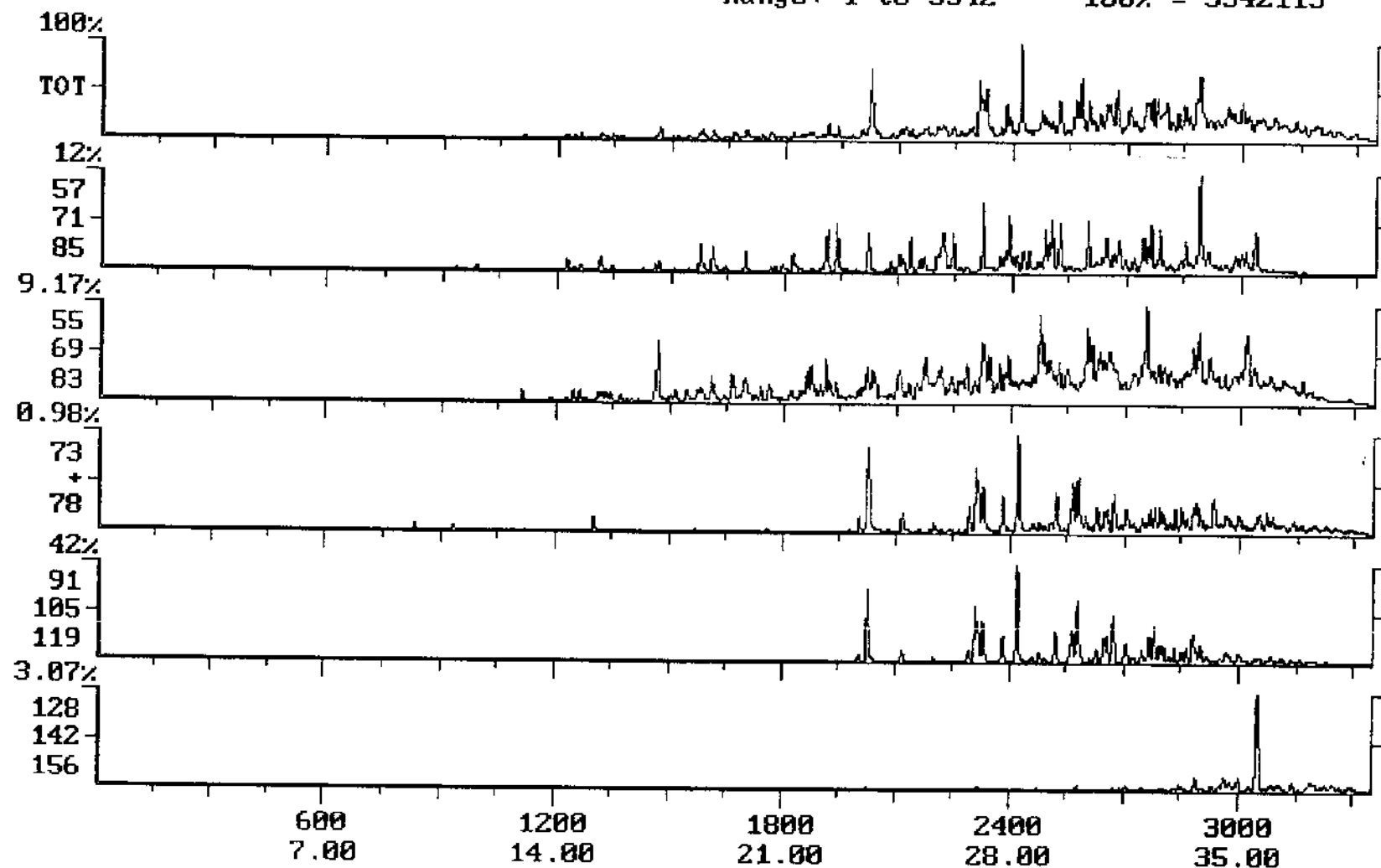
RIC: 0

Mass Range: 0 - 0

Plotted: 1 to 3342

Range: 1 to 3342

100% = 3542113





LABORATORY REPORT

GC/MS METHOD - BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES) + MTBE

CLIENT NAME:	Lincoln Applied Geology	PROJECT CODE:	not given
PROJECT NAME:	Morse Property, Bennington, VT	REF.#:	8,112
REPORT DATE:	January 21, 1994	STATION:	TP-4 4.3'-5.0'
DATE SAMPLED:	January 11, 1994	TIME SAMPLED:	15:30
DATE RECEIVED:	January 12, 1994	SAMPLER:	Bill Norland
ANALYSIS DATE:	January 20, 1994	SAMPLE TYPE:	Soil (95% Dry Wt.)

PARAMETER	PQL (µg/Kg dry wt.)	Concentration (µg/Kg dry wt.)
Benzene	105*	178
Toluene	105	288
Ethylbenzene	105	2,000
Xylenes	316	21,900
MTBE	105	BPQL

Surrogate % Recovery: 95%

BPQL = Below Practical Quantitation Limit (PQL).

*Note: The abundance of high molecular weight compounds prevents interference-free analysis at lower dilutions.

Chromatogram Plot

Comment: 8112 (LAG) TP2 5G > 10ML MECH >> 50UL TO 5ML H2O

Scan No: 1

Retention Time: 0.00

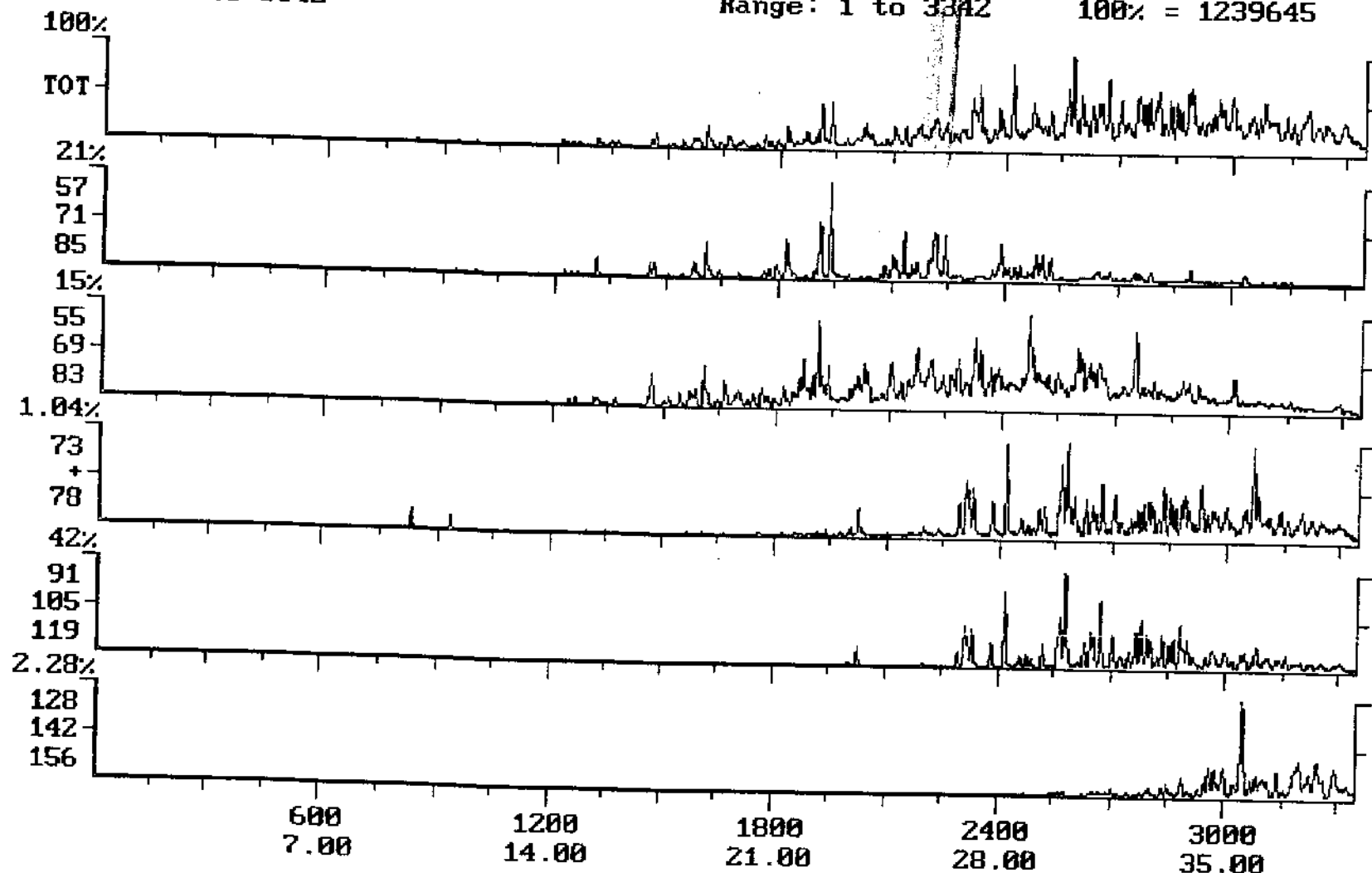
RIC: 0

Mass Range: 0 - 0

Plotted: 1 to 3342

Range: 1 to 3342

100% = 1239645



Chromatogram Plot

Comment: B112 (LAG) TP2 5G > 10ML ME0H >> 50UL TO 5ML H20

Scan No: 1

Retention Time: 0.00

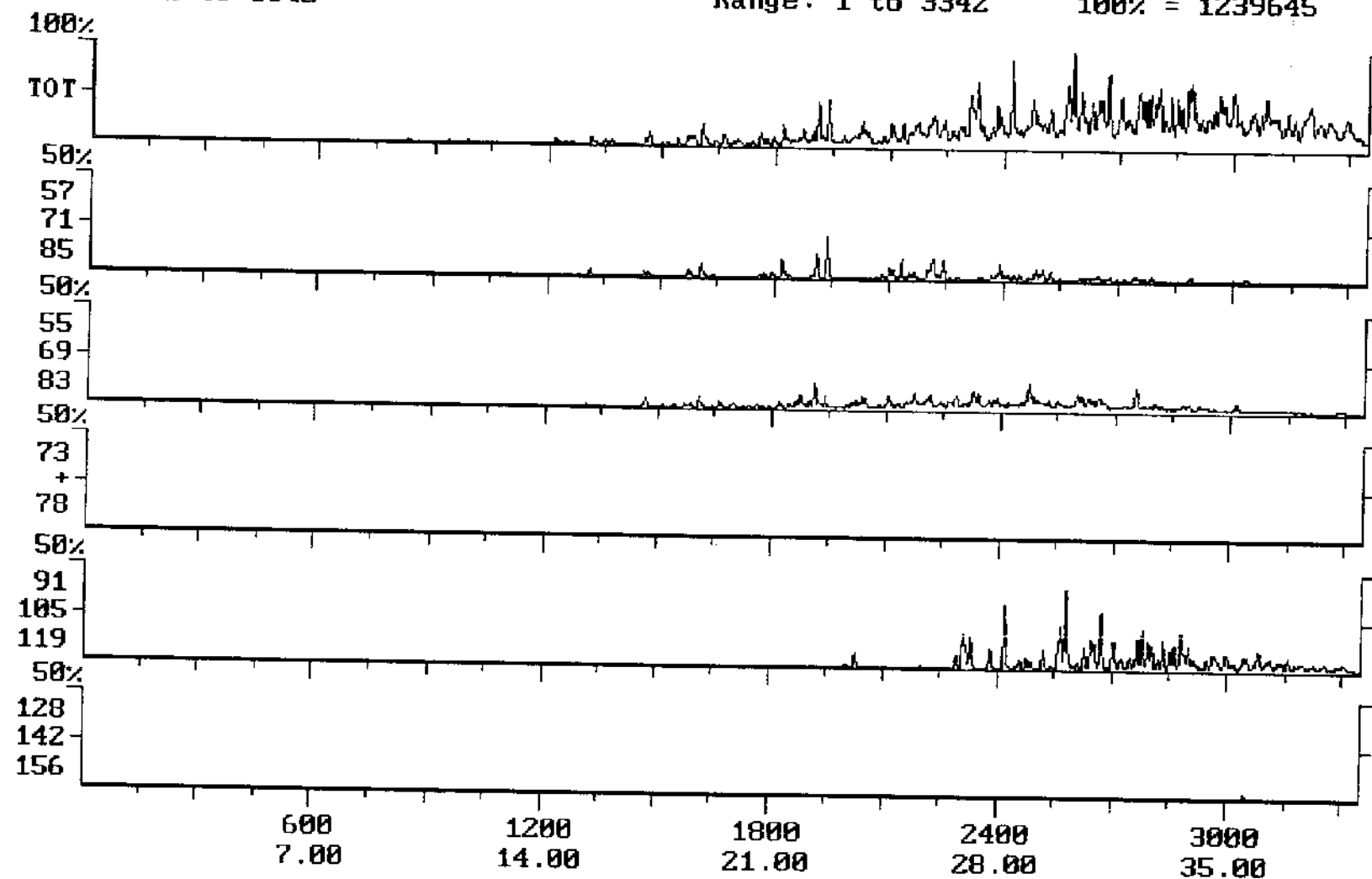
RIC: 0

Mass Range: 0 - 0

Plotted: 1 to 3342

Range: 1 to 3342

100% = 1239645





LABORATORY REPORT

GC/MS METHOD - BTEX (BENZENE, TOLUENE, ETHYLBENZENE, XYLENES) + MTBE

CLIENT NAME:	Lincoln Applied Geology	PROJECT CODE:	not given
PROJECT NAME:	Morse Property, Bennington, VT	REF.#:	8,112
REPORT DATE:	January 21, 1994	STATION:	TP-2 5.0'-6.0'
DATE SAMPLED:	January 11, 1994	TIME SAMPLED:	13:30
DATE RECEIVED:	January 12, 1994	SAMPLER:	Bill Norland
ANALYSIS DATE:	January 20, 1994	SAMPLE TYPE:	Soil (81% Dry Wt.)

PARAMETER	PQL (µg/Kg dry wt.)	Concentration (µg/Kg dry wt.)
Benzene	247*	BPQL
Toluene	247	BPQL
Ethylbenzene	247	921
Xylenes	740	6,040
MTBE	247	BPQL

Surrogate % Recovery: 94%

BPQL = Below Practical Quantitation Limit (PQL).

*Note: The abundance of high molecular weight compounds prevents interference-free analysis at lower dilutions.

Chromatogram Plot

C:\SATURN\DATA\8112TP1D

Date: 01/20/94 02:44:03

Comment: 8112 (LAG)TP1 D 1:500

Scan No: 1

Retention Time: 0.00

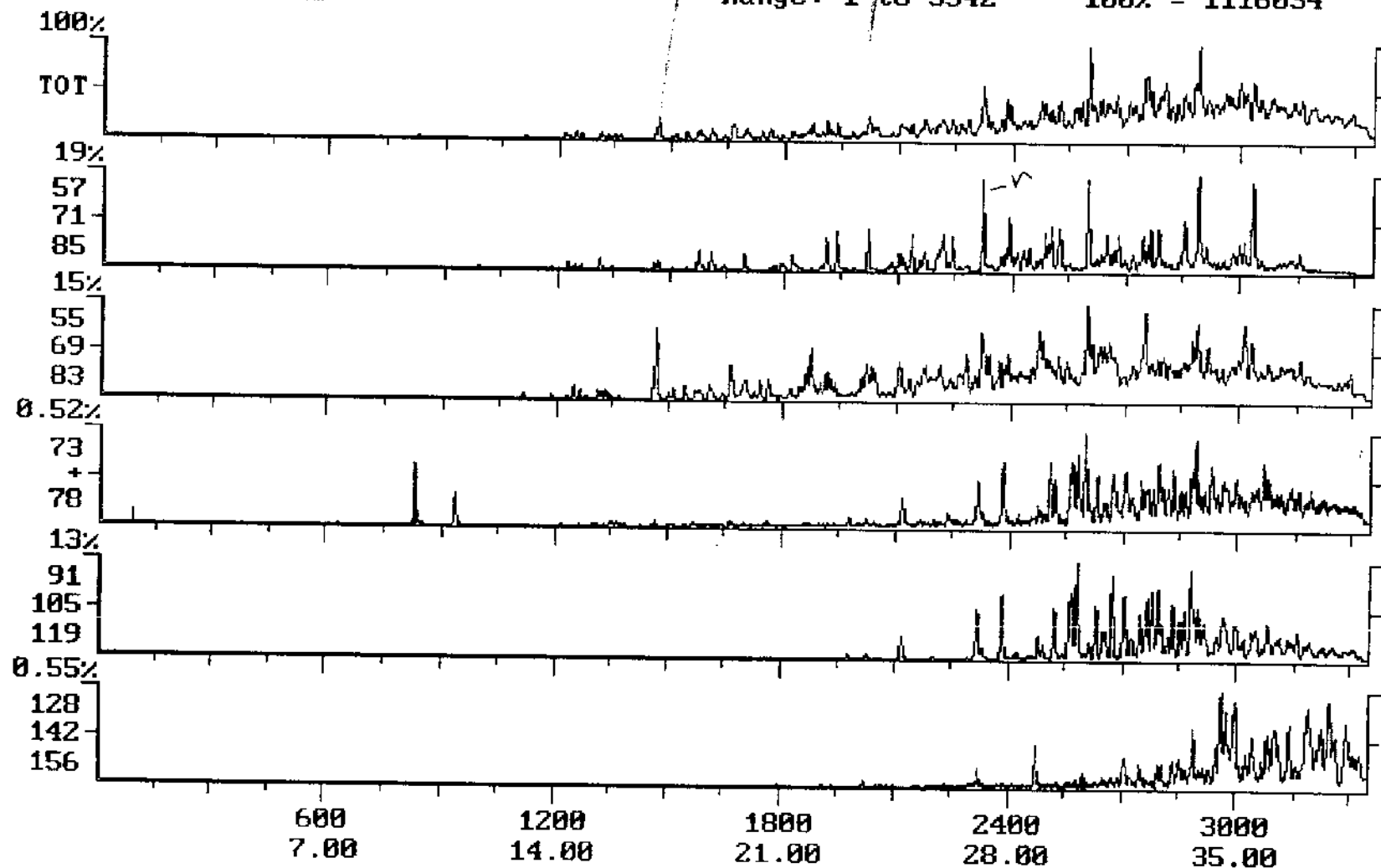
RIC: 0

Mass Range: 0 - 0

Plotted: 1 to 3342

Range: 1 to 3342

100% = 1116034



Chromatogram Plot

C:\SATURN\DATA\8112TP4

Date: 01/20/94 03:42:28

Comment: 8112 (LAG) TP4 1:500

Scan No: 1

Retention Time: 0.01

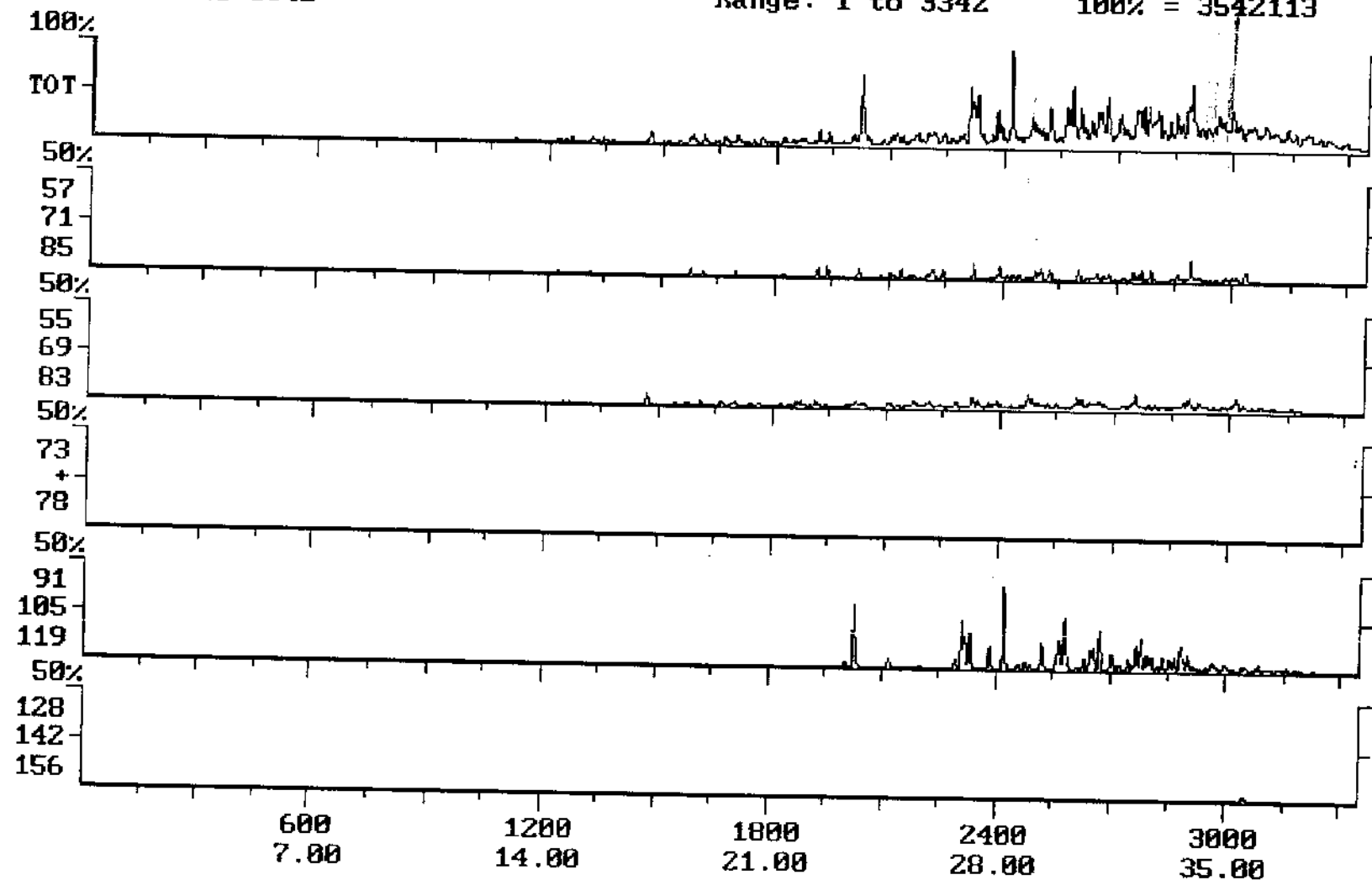
RIC: 0

Mass Range: 0 - 0

Plotted: 1 to 3342

Range: 1 to 3342

100% = 3542113



RR#3 Box 5210 P.O. Box 189
Montpelier, VT 05602
Ph. (802)223-1468 Fax (802)223-8688

CLIENT NAME	Lincoln Applied Geology, Inc.
ADDRESS	RD 1 BOX 710, Bristol VT 05443
PROJECT NAME	Morse Property, Bennington, VT
PROJECT NUMBER	
PROJECT MANAGER	Bill Norland
SAMPLER	Bill Norland

Page
1 of 1

MAV #

3 1 2

[illegible]

Relinquished by:

Received by:

Date/Time

Relinquished by:

Received by:

Date/Time

William North
for custody

Received by: *[Signature]*

1/12/94 G-7A
1/12/94 i 2m
